Cement MILL SECTION of

Concrete

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The First Cement Mill in the Straits Settlements

By C. A. Wilson

Thanks to American energy, patience, optimism and will power, there is today hewn out of the solid jungle beyond Singapore, a big clearing where stands the only cement mill in that part of the world where portland cement is being produced. There are offices and a modern laboratory, and workmen's homes already tangled with flowers. There are good roads and drained swamps. There is a big mill working on a minimum of carefully trained Chinese labor and a barrel factory turning out a hundred barrels an hour.

The Ho Hong Portland Cement Works is unique owing to the fact that there was manufactured the first cement made in the Straits Settlements, and also, so far as the designer knows, this is the first plant in which deep sea coral has been used as the principal raw material.

The works are situated in the Straits of Malaca, nine miles from Singapore, and the coral is brought from the beds to the works in tong kongs and is unloaded and stored adjacent to the works.

The clay beds, ranging in depth from ten to forty feet, cover the entire property of the company and the clay is reclaimed and stored by Sauerman Bros. draglines[1] and cable ways. These drag lines are operated by two Farquhar portable engines.[2]

The storage department building designed to house an adequate supply of coal, clay, gypsum and coral as well as 80,000 barrels of clinker, consists of a steel and concrete shed 92 ft. wide with two ten-ton 40 ft. span electric cranes running throughout its entire length and feeding the washmill with clay, the coal mill with coal, and the clinker weighing machine with clinker and gypsum, as well as feeding the coral to the crushers with grab buckets.

Since coral cannot be crushed successfully in jaw crushers a set of rolls was introduced as a preliminary breaker and the material further reduced by two sets of Traylor rolls.[3] The coral is then run through Giant

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[1] Sauerman Brothers, Chicago, Ill.

[2] A. B. Farquhar Co., Ltd., York, Pa.

[3] Traylor Engineering and Mfr. Co., Allentown, Pa.

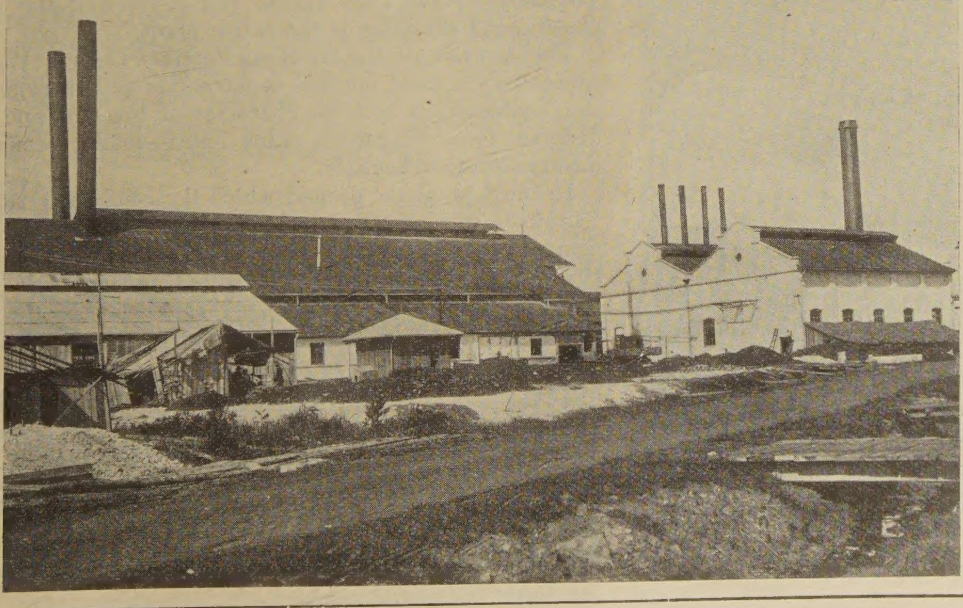

Fig. 1—Ho Hong Cement Mill

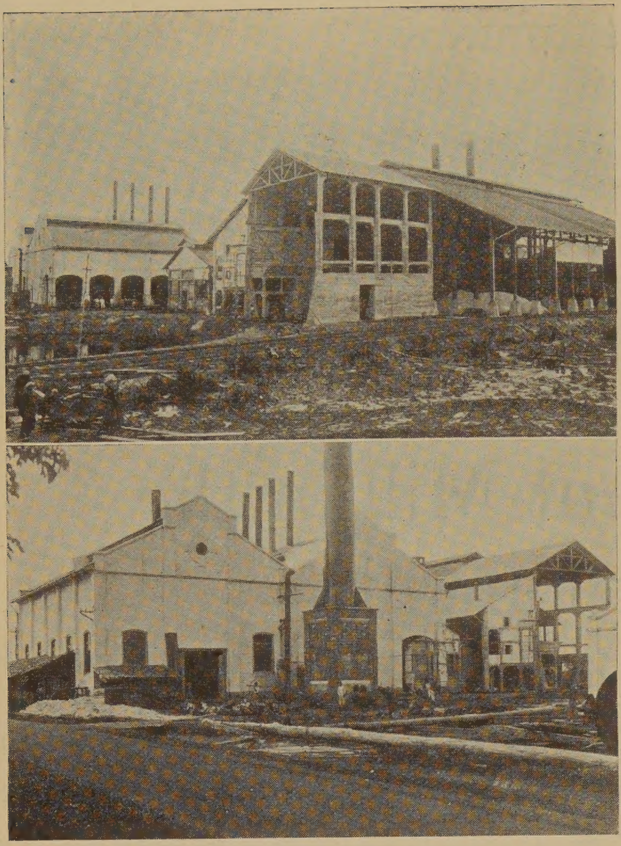

Fig. 2—View Showing the Mill Nearing Completion—(Bottom) Power Plant and Coal-Drying Building

Griffin mills,[4] the water being added at the feed inlet, and is passed with the clay (which had been previously washed in a Bradley Pulverizer Company's wash mill[4]) through Allis Chalmers tube mills.[5] The slurry from the tube mills is stored in three 22 ft. diameter concrete silos and from these is run into two connecting bins before being fed to the kilns. The kilns[6] are 126 x 7 x 7′ 6″, and were built by Masser & Sons.

After the clinker has been burned and cooled it is conveyed by a Caldwell pan conveyor[7] to the storage where it is further handled by the electric cranes previously mentioned. The finish mill consists of two Giant Griffin mills and two Allis-Chalmers tube mills.

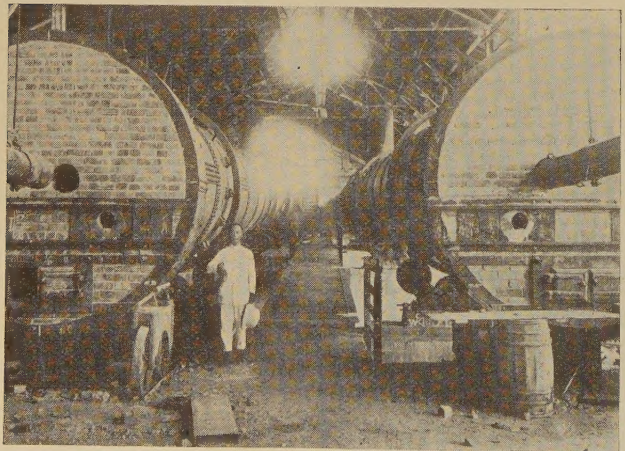

Fig. 3—Discharge End of Kilns, Showing Pipe Lines Where the Coal Is Blown In

The finished cement is packed in paper lined barrels and both Howe packers[8] and hand packing are used. Three hundred and seventy-five pounds of cement is packed in a barrel.

The Power plant is of British manufacture and consists of two Bellis & Morcom Units delivering 850 K. W., the steam being furnished by four Austral Otis boilers. With the exception of a few small motors and the switchboard, all electrical equipment throughout the mill was furnished by the Allis-Chalmers Co.

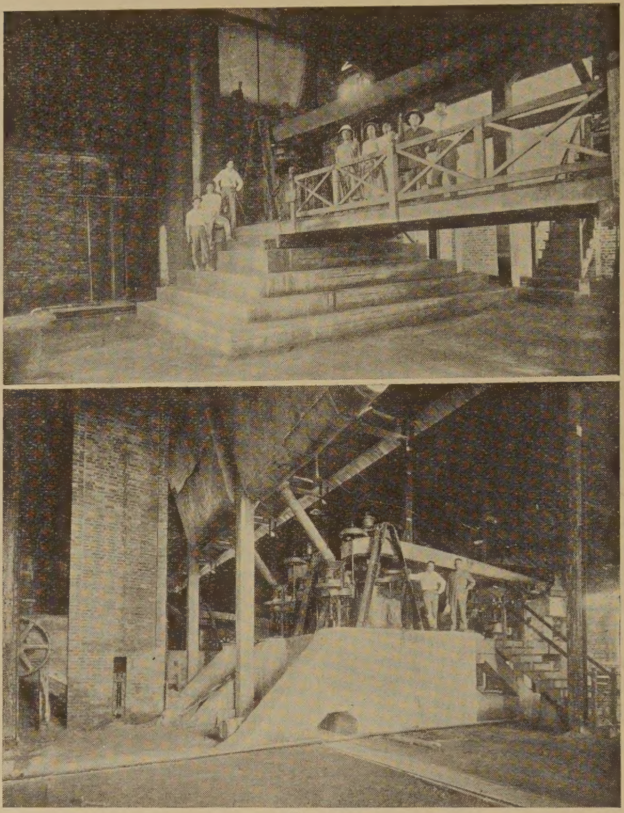

Fig. 4—Interior of Mill, Showing Some of the Grinding Equipment and Part of the Operating Force—(Bottom) Grinding Mills, with Feed from the Overhead Bins

The plant was designed by James C. Muir, assisted by Ralph Bird, and the erection work was carried out by Mr. Muir.

The Robertson-Cole Co. are the Ho Hong Cement Company's New York agents and supervised the purchasing and shipping of the entire plant.

The erection of the Ho Hong Portland Cement Works presented the most unusual construction and transportation problems, as both the character of the land and the distance from Singapore—nine miles—made seemingly unsurpassable difficulties.

In the first place, ground which the company's representatives were assured in New York was as "flat and firm as bed rock" was a mass of enormous tangled tree stumps and roots, enmeshed trees, undergrowth, cut through and through with soggy canals where the sea water rose every day, and an especially high tide flooded the whole district. The crocodiles were so bad in the mouths of the streams that at times the coolies refused to work.

The location had not even been surveyed; so that was the first task. After that came months of laborious clearing and blasting and hauling out stumps with bullocks and by native coolies. The fact that 33,000 piles were driven for the foundation of the mill gives some

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[4] Bradley Pulverizer Co., Boston, Mass.

[5] Allis-Chalmers Mfg. Co., Milaukee, Wis.

[6] Masser & Sons, Allentown, Pa.

[7] W. H. Caldwell & Sons Co., Chicago, Ill.

[8] S. Howes Co., Silver Creek, N. Y.

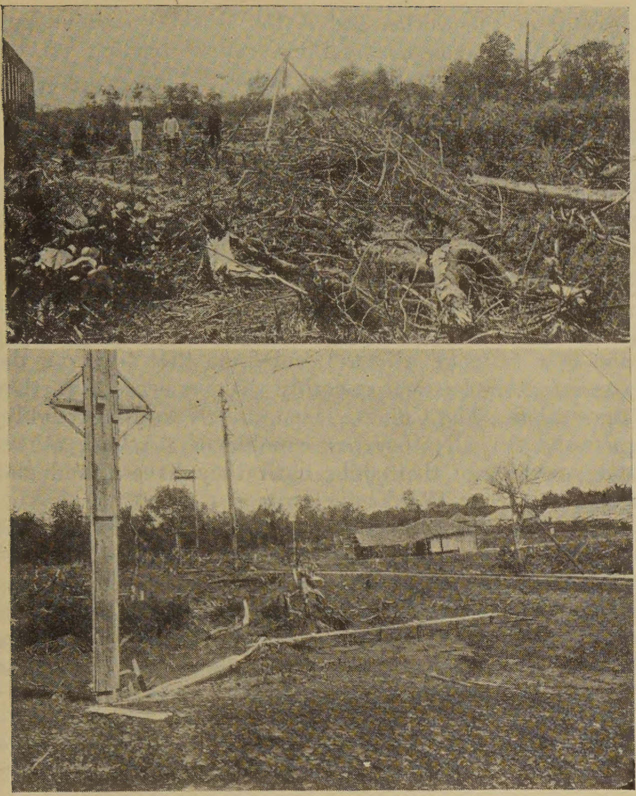

FIG. 5—CLEARING THE SITE FOR THE PLANT

The type of jungle which had to be cleared before the mill could be erected. The trees have already been cut here, but the picture gives no idea of the soggy land where every tide hampered the work that had already been done.

idea of the enormity of the task.

But nothing can give to the American who has not worked in that section any knowledge of Chinese coolie labor. For instance Mr. Muir wanted all the brush and trees burned up and gave that order, but days went by and nothing happened. He tried to get results and finally learned that he must wait until Friday which appeared to be the mystic day.

On Friday all the coolies gathered and prayed. They asked for forgiveness of the tree spirits for disturbing them but bemoaned the fact that they were but coolies and slaves and they had received an order from the head coolie, who got his order from the foreman, and so on back through Mr. Muir, the President of the United States, King George and lastly Almighty God.

It it rained the coolies couldn't work—not because it hurt them, but because it was a custom. When at last the roof was on the building, every one rejoiced in the fact that rain would no longer be a reason for stopping work. But to this day, roof or not, when it rains, work ceases.

All of the machinery except the boilers came from America, and as Singapore where the parts were unloaded from the ships, was nine miles away and the roads bad, the task of getting the machinery to the spot was great. To facilitate transportation of materials and to allow access to tidal water, a canal was dredged from the Ho Hong River through the plant site. This canal extends the entire length of the works and will accommodate a 200 ton barge. A Sauerman Bros. dragline equipped with a half-yard bucket was used to dig the canal. But very little of the machinery could come by way of the canal. Most of it had to be hauled by bullocks from the quays. There were at times 40 bullock carts hauling at once. Fig. 4 shows five or six of the tented roofs over the carts. Naturally the roads were not made for that heavy traffic and collapsed again and again, which meant more work.

The material for the cement comes from nearby,—sea coral and estuarial mud. The clay is dug right on the ground, but the coral is obtained from reefs between Nonga and Tanjong Malang Orange about seven miles away and brought in by water in Chinese Junks. At present the company is using gypsum from India, but was bought and is about to operate a gypsum mine in the Dutch Island.

The Ho Hong coral analyzes:

SiO_2	0.60
Al_2O_3 Fe_2O_3	0.30
Ca CO_3	95.42
Mg CO_3	1.82

and the clay analyzes:

SiO_2	52.40
Al_2O_3 Fe_2O_3	22.20
Ca Co_3	Trace
Mg CO_3	1.88
Loss by Ignition	18.65

Approximately 29 parts coral are used with 10 parts clay. The clay after having been washed in a Bradley Pulverizing Co. washmill is mixed with the pulverized coral at the feeders of the tubemill. Adequate raw storage has been provided from which the raw material is drawn off to the correcting basins after which it passes to the kilns.

The crushed coal is dried in a Cummer dryer[9] and ground to proper fineness in a Giant Griffin mill. This coal which is Malayan from Rawang analyzes:

Moisture	9.85
Vol. Com. Matter	44.85
Fixed Carbon	38.60
Ash	6.70

The cement is a soft blue gray, very grateful to the eye in the climate where everything white catches and reflects the light so vividly. It has an initial set of 1 to 2 hrs. and a final set of 4 to 6 hrs. although at necessity the proportions can be changed for a quicker set.

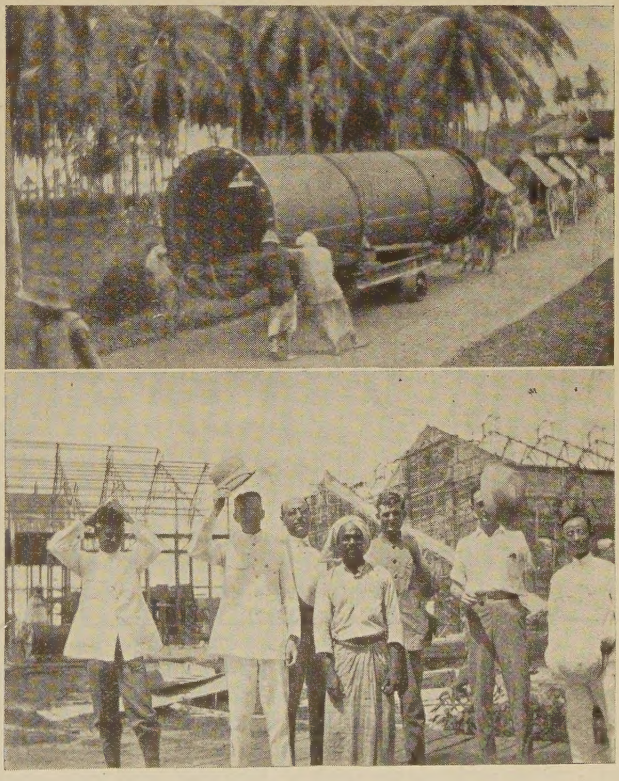

FIG. 6—HAULING THE MACHINERY FROM SINGAPORE WITH BULLOCK CARTS—AS MANY AS 40 CARTS HAVE BEEN USED AT ONE TIME—(BOTTOM) MR. MUIR BETWEEN TWO OF HIS INDIAN HELPERS

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[9] F. D. Cummer & Son, Cleveland, O.

In the complete adjoining laboratory under J. H. Eschen tests made indicate that the cement supercedes all standards for strength and fineness which have been laid down by the authorities. In fact, in a slab of average mix, the Straits standard is 200 lbs. while this cement has a breaking strength of 365 lbs. per sq. in.

The mill's capacity at the present writing is 1,100 barrels a day, but it is so designed that later it will be possible to have an output of 5,000 barrels. It is planned to capitalize it for further development at $2,500,000.

There is a great market for the cement here. All over Singapore building is going on, slow work, naturally, as everything must be carried up the plank inclines by hand —but imperative both for business and homes. With materials coming from so near at hand, the coral barges and gypsum mine and barrel factory all contributing to the economic independence of the organization the company is in a position to underbid all contractors in the locality. The F. M.S. railways have run spur lines to the mill and are only waiting for steady production of cement to start work on their new $5,000,000 station and hotel, quite a construction for what we in America think a little end-of-the-line place.

The company, of which Lim Leow Kiew, is managing director of the works, and Ralph Bird, superintendent, is planning to do considerable export trading up the coast and to the Dutch East Indies. They are making a special type of barrel for that trade. The wood, a native tree called seraia, is obtained nearby. The hoops for the home barrels are of rotan, those of export barrels of iron. Twenty men are employed in the factory turning out 100 barrels an hour and the cost exclusive of the work is 7 cents per barrel. The American furnished barrel is quoted in Singapore at $2.10.

It is an interesting commentary on Chinese intelligence that it took exactly 20 minutes to teach a Chinaman how to make a barrel and from that time on, the barrel factory has run smoothly without need of further supervision. The Chinese learn quickly and thoroughly, once and for all; they are capable of teaching others and never leave their jobs until they have found and trained someone to take their place.

When you know a characteristic like that, it makes it doubly hard to understand for instance why it is impossible to train a coolie in the use of wheelbarrow. Every pound of coral or coal or stumps cleaned out had —and still has—to be carried in the great deep baskets they wear yoke-like on their shoulders. They cannot be induced to use a wheelbarrow.

Looking Back to the Days of the "Mud Floor"

The Conclusion of an Article

By Charles W. Erdell
Bethlehem, Pa.

In the previous article our trip was halted when the spreader had shown us how the mud is distributed over the floor. The next part of the process will be the stamping of the mud by the "stamper" boy. This lad is equipped with two tools, which are the gauge and the stamper. The former (shown in Fig. 2A) is a bar of say 3/8 in. round iron and about 3½ ft. long. The upper end is formed into a handle and to the lower end is attached a plate, which is about 2 in. square. The plate is secured to the rod by the rod passing through its center. This end of the rod is threaded and the plate is kept in position by two nuts, the plate being adjusted so that it is about 1¼ in. from the end. The gauge is used to determine whether the thickness of the mud, as distributed over the floor by the spreader, is correct. The boy plunges the gauge into the mud, and if no impression is left on the surface of the mud, the spreader must remedy it by distributing more mud to that particular point. If it is found that the gauge leaves a mark of considerable proportion on the surface of the mud, then the spreader must remove the surplus so that the thickness of the mud is very nearly uniform throughout and the resultant bricks will be of a uniform thickness. Nothing is worse than to have various thicknesses of bricks, and a spreader that cannot keep his mud spread uniformly will not last long on the mud floor.

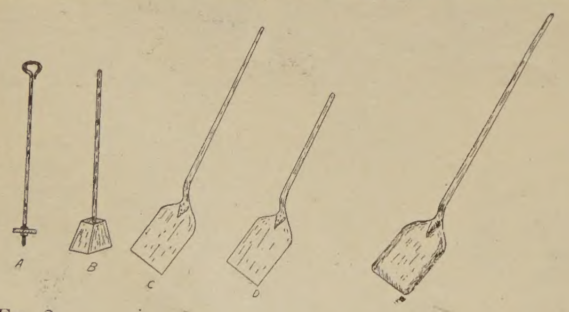

Fig. 2

You have watched the boy gauge the thickness of the mud at many points, and after he is satisfied that the mud has been properly spread, he will get busy with his stamper (Fig. 2B). Here he comes now, with the stamper in his hands, ready for business. I guess we can halt him a few minutes to examine it and see how it is constructed.

It is, as you may perceive, merely a block of wood, 6 in. square at the bottom, about 7 in. high, and tapers to a dimension of only about 5 in. square at the top. Into the top is inserted a handle, which is about 4 ft. long and resembles a short broomstick. The bottom of the stamper is covered with a piece of 1/16 in. sheet iron. It is this boy's duty to stamp the mud into a solid, compact mass in order that the bricks will not be porous and easily broken.

We will now hand him back this most useful instrument and see how he manipulates it. He commences at the extreme end of the floor and deposits the stamper exactly in the corner. He now grasps the handle in such a way that will enable him to keep it in such balance that it becomes an easy matter for him to move backward over the mud at a steady gait and work the stamper up and down with such speed and precision that an examination of the marks left by the stamper upon the mud will reveal the fact that each impression is matched by the following one. Stamping is an art acquired by some practice. It is relatively easy after one has been "broken in," but, oh, the backaches for the first week of learning it. The stamper boy, if he is lazy, is a poor asset for the company, as he does not put much "elbow grease" into the work, and as a consequence the bricks are of an inferior quality and much waste is caused by his half-hearted work. When the stamper boy is through with his work he takes his stamper, leans the handle against some post or steam pipe, and sits upon the lower end, thus testifying to all around him that he has done his bit and is enjoying a well-earned rest. The mud now looks for all the world like the map of some Western state, where the counties are laid out in exact squares. However, little ridges are seen to surround each little "county," and it is now the business of the "smoother" to take out these creases and other marks that were left by the stamper boy.

THE "SMOOTHER"

While the stamper boy is enjoying his rest we will carefully take note of what happens next. After the mud has been stamped no one is permitted to step onto that portion of the mud, because the heavy footprints of the shoes would make a deep indentation in the mud and no amount of smoothing will remove it. Anyone that trespasses on the mud after it has been stamped finds himself in ill favor with the smoother. The smoother's implement (Fig. 2E) is a long-handle, square-point shovel, which is built very sturdily. You see, he stands on the un-stamped mud and is careful not to rest the whole weight of his body on any one foot, but tries to keep on his two feet as much as possible. He now takes the shovel and commences to strike the mud with the bottom of the shovel, beginning at the portion nearest his feet, and propels the shovel forward, giving short, hard whacks to the mud. Now, when the shovel has reached an arm's length, he raises the handle and draws the shovel back towards himself, at the same time exerting an even pressure upon the lip of the shovel. By doing this he smoothes the mud very nicely the width of the shovel. He now moves aside one step and repeats the operation, until he has covered the entire width of the floor. You might call him, also, a "mud polisher," because the appearance of a well smoothed stretch of mud will make you think that some one has been there and used furniture polish, as the surface is so very shiny.

You have now seen, within the space of about ten minutes, the first three operations on the mud floor—spreading, stamping, and smoothing. The next operation is called "cutting." However, as the mud is still somewhat soft, it will not be possible for the cutter to commence immediate operations. So, to while away the next thirty minutes, I will take you with me to that wonderful spring of cooling water that nestles at the foot of the hill, over the meadow. The company has enclosed the spring with a concrete wall and has placed therein a number of brook trout. As we bend over to fill our cups with the refreshing draught, the fishes become inquisitive, as they think we have come to feed them with some choice bits of raw beefsteak. However, like most of us humans, they must also have their disappointments, and we will leave them to their natural environment, while we retrace our steps to the mill.

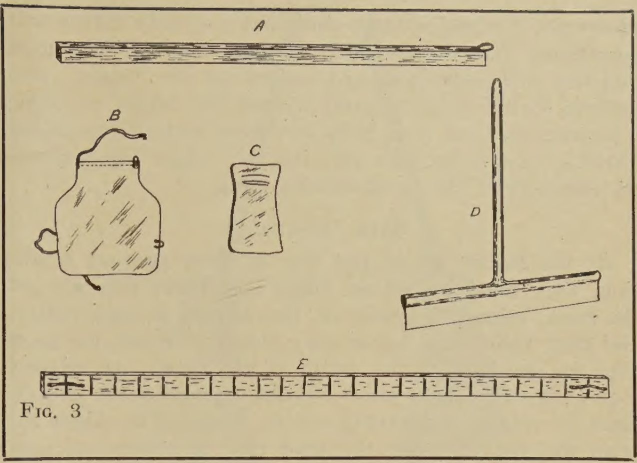

Fig. 3

THE CUTTER

You are surprised to find that the cutter is already on the job. The reason for this is obvious. If he would wait too long, the mud would become too stiff and hard, and he would have much more of a job to properly cut it than otherwise. He is equipped with a cutting tool and a cutting lath. I will describe the lath (Fig. 3E), which is an inch in thickness and 4 in. wide, and as long as the floor is wide. The lath is marked off in 4-in. sections throughout its entire length. At each end is fastened a handle. The cutting tool (Fig. 3D) is a piece of 1/16 in. steel, 3 in. wide and about 2½ ft. long. A handle somewhat thicker than a broomstick is fastened to one edge, and the opposite edge is tapered and very sharp. The cutter must have keen eyes, as you will now see. He places the lath on the extreme end of the mud that has been smoothed, and makes certain that it lies at right angles with the steam pipes. He now takes the tool and inserts it in the mud, close against the lath. He places his right foot on the upper edge and against the handle, and, firmly grasping the handle, propels the cutter through the mud, using the weight of his body to press the cutting blade down on the floor. When he has crossed the floor he turns around and repeats the operation along the other side of the lath. He is now at the starting point. He now grasps the handle of the lath and deftly flips it forward the distance of its own width. Here is where he must use good judgment, else he will cut the mud into unequal portions and make bricks of odd sizes and shapes. The bricks are to be 4 in. square. He repeats this operation until he has cut about 3 ft. of the mud.

He must now cut the mud at right angles to his original cuttings, and here is where his very best sense of plane geometry is most needed. He inserts the cutting knife in the mud at the marks on the lath and pushes it across the mud, only this time he has no lath as a guide. He is all business and attention when he is cutting crosswise. In a few minutes he will have reached the other end of the floor, and the next section that he cuts will be easier, as he now has a guide to go by, in that he has his lines laid out in both directions, and it is only a question of cutting to meet the other marks. By this time, as you look down the length of the floor, you will see nothing but a vast expanse of smooth mud.

While we have been out for a drink and have been watching the cutter in his first few sections, the others have been busy and have finished their work on this floor and have gone to another floor. The cutters become very expert in their work, and it is truly wonderful to see them skim across the lath, back and forth, and make the cross-cuts and yet do it with such accuracy.

However, it remains to be said that a speedy cutter will sometimes fail to cut deep enough through the mud and this will make it a hard matter for the "edger" who follows in his wake to properly set the bricks on edge. Yes, the mud as it is now cut into sections is called "bricks," and it remains only for the "edger" to perform the last task of the brick-making gang.

The "Edger"

As the bricks would not dry in their present condition, they must be set on edge, and from this we get the term "edger." There are two edgers to each cutter, and they follow the latter very closely. Each one must edge up one-half of the width of the mud. An edger's tool (Fig. 2D) is a short-handle, square point shovel, light in weight and having a keen edge. The edger inserts the shovel under the mud that has been cut into bricks, and, with a rising motion, withdraws it laden with four bricks. He turns half way around and lowers the shovel to the floor at the spot where the bricks have just been taken away. He sets the two lower bricks on edge and raises the shovel at an angle of about 70 degrees. The lower bricks now slide off the shovel, and when the top of these bricks are even with the lower side of the shovel, the shovel is lowered and the connection between the lower and uppr bricks is broken. He now deposits the other two bricks against the first two. He now has four bricks standing on edge, and he repeats this process hundreds of times, and when the day's toil is over we have many long rows of bricks over the entire length of the floors, as in Fig. 4. One of the edgers is left-handed and the other is right-handed, i. e., the shovel that is guided by the right hand is called the right-hand shovel, and the one that is guided by the left hand is called the left-hand shovel. The left-handed operation is the hardest, so nearly every one wants to be a right-hand edger. This job is very hard on the edger's back, as he is compelled to work continually in a stooped position, and when his day's work is over he can well say that he has earned his "pay."

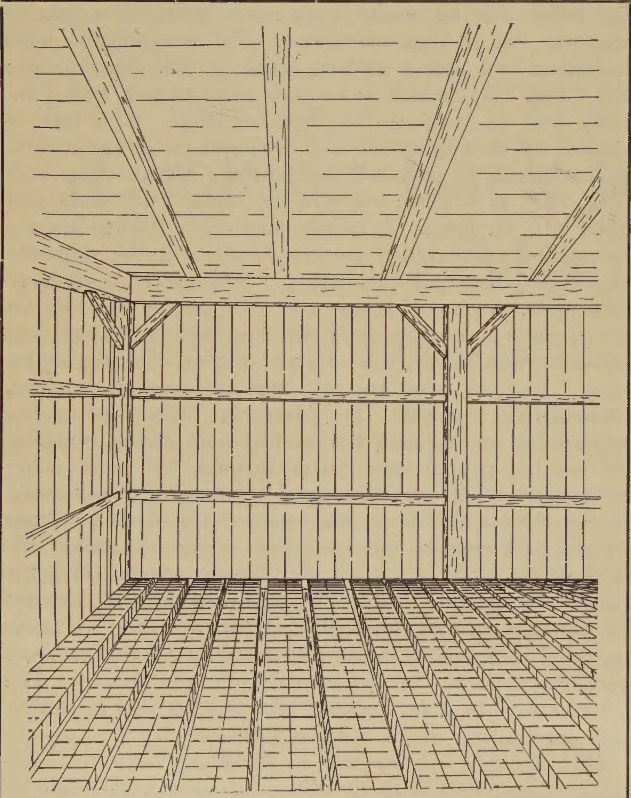
Fig. 4—Sketch Showing Rows of Bricks as Deposited by the Edgers

The bricks that have been made today will remain in this position until tomorrow morning, when the "hacker" boy will come along and place them against the steam pipes. We will now proceed to the "canal" floor, where the bricks were made yesterday, and watch the youngest employee of the plant, the happy "hacker" boy, who may be anywhere from 13 to 16 years of age, perform his share of the work.

The "Hacker" Boy

I will tell you of my experiences as a "hacker" boy, and they will be representative of those of the other boys that engaged in this hard work. The laws governing the employment of child labor at that time required that no one could be employed unless he had reached the age of thirteen years. Compare that with our present limit of sixteen years! I could hardly wait until my birthday arrived, in order that the proper certificate could be secured that would admit me to the mysteries of the mud floor. How I longed to work in the cement mills, where others of my friends were already employed! Had I known, however, what the future had in store for me, I might not have been so anxious.

The longed-for day arrived and I secured my credentials, and I shall always remember my first day's experiences on the mud floor. If you will remember that trolley cars were not so very plentiful in those days, and did not run to all corners of the universe, you may appreciate it when I say that 4 a. m. was my rising hour and then I would hike four miles to the mill. Work commenced at six, and we finished by the middle of the afternoon. And then walk back home four more weary miles!

On my first morning I stepped into the mill and hung up my "can" and was duly provided with the hacker boy's equipment—a bib and hand-leathers. The bib (Fig. 3B) is a means of protection for the chest and is made of a piece of old leather belting and is suspended from the hacker boy's neck by a piece of rawhide belt lacing and is fastened to the body by the same means. The hand-leathers illustrated in Fig. 3C are cut from the uppers of old rubber boots. Hand-leathers are indispensable as it is impossible to handle the bricks with bare hands and not get blisters.

I was told where my work awaited me, given a few simple instructions as to how to proceed, and was then left to my own devices by the other hands. They were "initiating" a "greenhorn." Well, greenhorn I certainly proved to be. I had always been a lover of the great outdoors, and here I found myself in a stuffy, hot, and dusty cement mill. With the greatest effort I managed to put in about two hours of work, and then I found myself sitting on a row of bricks, with my head in my hands and all the world going round and round, hacks falling over, kilns spouting flame and smoke and pandemonium reigning supreme. In a short time my "buddies" saw my plight and helped me out into the open, where I soon regained a clear head. I had had a taste of the life and resolved to stick it out. I had various jobs on the floor and, strange to relate, was never happier than when I was dirtier and dustier than any one in our gang.

We are now on the "canal" floor, and you notice that these bricks are quite dry. They were made yesterday, and during the night all the windows in the mill were closed and the exhaust steam from the engines was turned into the steam pipes. This created a high temperature, and the bricks readily lost a lot of their moisture.

"Mike" is a little Slovak and he can "hack" as well as the next one. See how nimble he is and how carefully he deposits the bricks among the pipes. Hacking is a simple job, but it is hard work withal. You see how Mike stoops over the rows of bricks and loosens six or seven with his foot, then grasps them in his handleathers and, while still in a stooping position, brings them up to his bib and exerts pressure with both hands. This splits the bricks into halves and he now stands erect holding six or seven single bricks in each hand. He walks to the steam pipes and sets them down about one-half inch from the pipes. He builds up the rows in this manner until all the bricks have been removed from the span which he is required to hack. The finished work is called a hack, which means "a place for drying green brick," shown in Fig. 5. The bricks are left in the hack until the next morning, when the kiln-filler comes with his big wooden barrow and piles them high in the barrow in pyramidal formation.

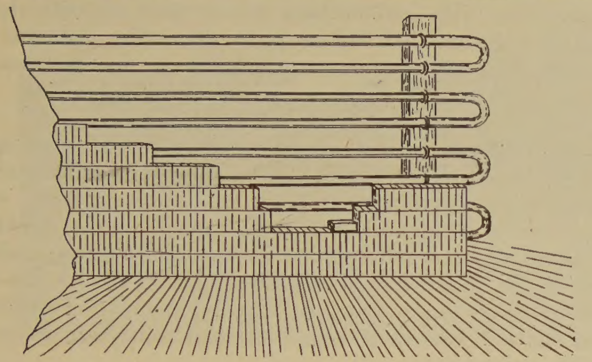

Fig. 5—Hack for Drying Green Brick

The Kiln-Filler

The bricks that were hacked yesterday will be pretty nearly dried out by this morning, and will be ready to be put into the dome kiln by the fillers. Next to mudwheeling, kiln filling is the hardest job here. The wheelbarrow is so constructed that when it is loaded to capacity the load is pretty evenly balanced. The knack of loading the barrow must be well mastered, else the load will shift while the barrow is being taken to the kiln and bricks will fall off here and there, which, of course, must be avoided. We will take a look down into the empty kiln (Fig. 7). The first layer is made of combustible material (cord wood, etc.). Next is a layer of coke, and on top of this coke will be placed the first "ring" of bricks. As the kiln is too deep for the barrow to be let down into it, two of the men are in the kiln—one at the bottom and the other half way up. The bricks are dropped by the man who wheeled them to the man higher up, and he in turn drops them to the last man, who carefully sets them on the coke. When the ring (circle) has been completed, a layer of cracked coke is placed on top of the bricks, and then bricks are placed on top of that coke, and more coke on top of those bricks, and so on, until the kiln has been filled to such a height that will admit of the barrow being let down into the kilns by means of a plank. The work of filling the kiln is very rapid from now on, and by noon we shall see that they are up to the door with the bricks. The kiln is filled as high as it is possible for the barrow to enter, which is about 5 ft. above the mud floor level. The last thing that is put into the kiln is some underburned clinker that was taken from one of the other kilns. This is called "yellow clinker," and it is placed on top of the charge in order that it may receive the benefit of all the heat that passes upward, as it is very hard to make good clinker out of it.

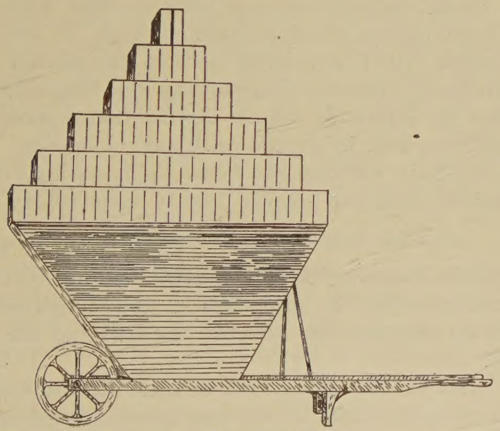

Fig. 6—Kiln Filler's Wheelbarrow

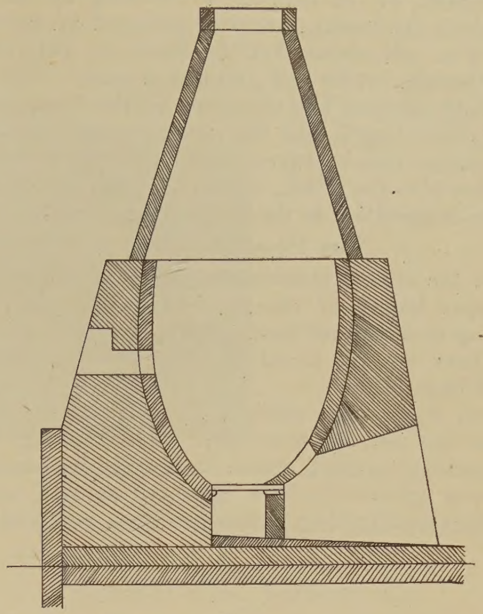

Fig. 7—Cross Section of Kiln

When a kiln is in operation, the heat is very intense, and, as a protection to the sheet iron door, the opening of the kiln is walled in with whole bricks. This must be done securely, otherwise the wall will fall in when the mass of bricks moves downward in the kiln and a red-hot door will be the result. When the door has been walled up and the sheet iron door closed, the kiln-fillers proceed to the basement, where they insert some oily cotton waste in the bottom of the kiln. The torch is applied and in a short time a dense, yellowish smoke can be seen issuing from the top of the kiln. The kiln will be a raging inferno by tomorrow, and as the fuel becomes exhausted the fire gradually dies out, and on the third day the door of the kiln is opened by the men, who empty it. This permits cool air to enter, and after the mass of clinker has somewhat cooled, the men remove the clinker from below and haul it on barrows to the pot crusher, after which it goes to the Griffin mills and is reduced to finely ground cement, and is then conveyed to the stockhouse. Sometimes the heat becomes too great in one portion of the kiln, and as a consequence the clinker and fire brick fuse, and the surrounding clinker will not move to the bottom. Long rods are used to pry loose this refractory clinker, and often the bricks are torn from the lining of the kiln. These spots must be patched by the bricklayer before the kiln can again be used.

The Waste Man

You have now seen everything of importance, with the exception of the final act of cleaning up the floors from which the bricks have been removed by the hacker boys. You will notice that the floors are littered with bits of broken bricks and granulated mud. This waste is carefully scraped into the center of the floor, throughout the entire length, and the waste wheeler comes along and shovels it into his barrow and hauls it to the elevator that takes it to the mixer, where it is gradually mixed in with the composition in the mud-making process.

THE PACKING HOUSE

After the cement reaches the bins it is left to season the proper length of time, and is tested, and packed according to orders on hand. The labor here is manual, as we have not yet heard of the valve-bag and automatic filling machine.

A few words with reference to the various brands. Here in this mill we have three distinct grades of cement, namely, natural, which is simply the burned cement stone ground fine; the improved natural, which is of a better quality than natural, as some portland clinker has been added, and portland. However, large dealers have adopted their own brands and, consequently, the market is flooded with brands of cement that may be made by the same company. In time this will all be done away with and nothing will remain of such dealer's brands but their memory, as no mill can afford to market its product under any other name but its own.

REMINISCENCES

Our trip is over and we are again in the present age. As we look back to the old days, what memories spring up and what scenes pass before us as we recount our early days of an industry that has such a remarkable history! What would we not give if we could in reality pay a visit to the mill as it existed in those days. However, as it is impossible to do this, I have tried to show you the old mill as it was, and with Ben Bolt we will softly murmur:

> "The mill has gone to decay; no sound,
> But a quiet now reigns all around."

The Cement Supply, American Expeditionary Forces

The Fourth of a Series of Articles

By Edwin C. Eckel[1]

In the preceding articles of this series, the two methods of cement procurement for the A. E. F.—purchase and manufacture, respectively—have been described. It remains to note the manner in which the cement so procured was passed on to the troops who needed and used it.

THE ORGANIZATION OF DISTRIBUTION

From the beginning of the A. E. F. activities in France until the early spring of 1918 most of the cement procured was passed on directly from purchase point to point of use. Throughout the entire period, in fact, all of the large tonnages bought by and for the French contractors working for the A. E. F. was so handled. In that case it was shipped from the yard or mill of the seller directly to the job on which it was to be used; so that as regards this particular fraction of the supply there was no depot system and only very faint traces of any other sort of system. But with regard to the larger fraction bought by the E. P. O. for American use, the depot system was beginning to function even during 1917. Most of the slag cement and other material bought by the E. P. O. during 1917 was intended for specific jobs, and was to that extent shipped directly; but the balance was held in storage at the Gievres depot and was issued on requisition.

In March, 1918, a general reorganization permitted the installation of a definite depot and requisition system for the cement, which was now arriving in quantity under the English contracts. The depots were now under the Depot Section, Office of the Chief Engineer, A. E. F. The cement distribution under this arrangement was in charge of Lieut. Goodman, who devised all of the forms, requisitions and records that were used in this work during the remainder of A. E. F. activities.

In August, 1918, the depot section was placed under the Division of Military Engineering and Engineer Supplies; but the system of cement distribution remained the same and was still in charge of Lieut. Goodman. This system had been working chiefly on the handling of English cement, and had proven highly satisfactory.

THE DEPOT *versus* THE MILL

Meantime, however, the shipments from our own mills had been growing in importance, and a quarrel was growing up concurrently between the mill and the depot sections.

The basis of this opposition in interest, insofar as it was based upon technical and not upon childish or personal grounds, may be summarized about as follows:

As representing the cement-procuring end of the mat-

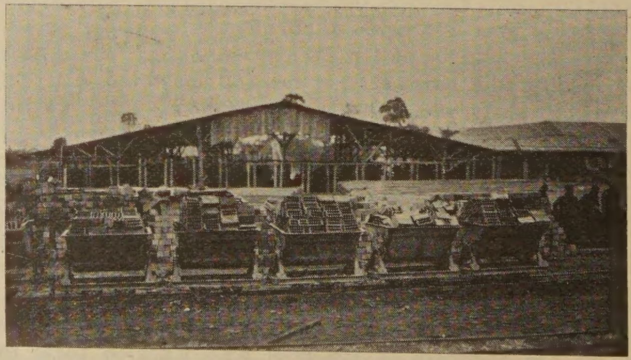

FIG. 1—CEMENT BLOCK FACTORY AT MESVES HOSPITAL, A. E. F.

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[1] Major Engineers, U. S. R.

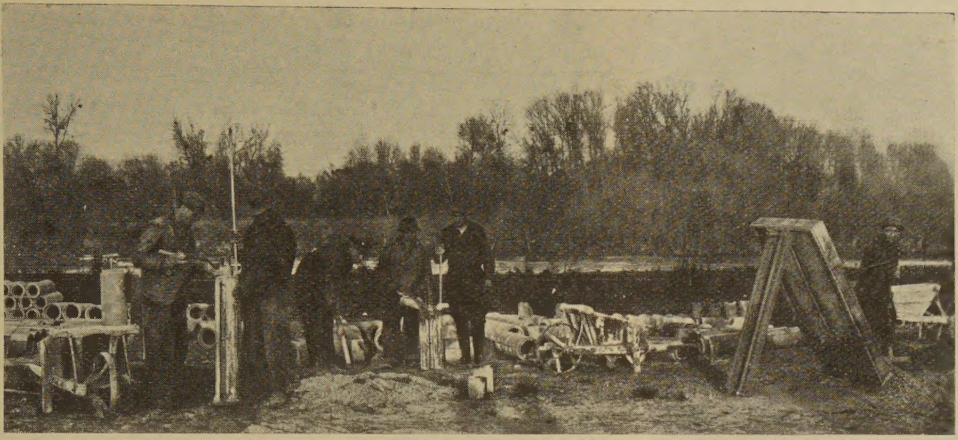

Fig. 2—Cement Product Plant at the Guerville Mill, Operated by Co. 6, Engineer, Attached to the Cement Section
Photo by U. S. Signal Corps

ter, Lt. Col. Spackman held that in order to supply intelligently the needs of any particular project, the orders for cement should be placed directly with the Cement Section, E. P. O., which could then decide what mill could best furnish the kind and quantity of cement required. From the standpoint of economic mill-operation this was undoubtedly a sound position in theory; but the Depot officers pointed out that orders were decreased or increased very frequently and very suddenly; that it was often necessary to change the destination of cement shipments en route; that most of the mills were so located as to be chronic sufferers from car shortage; and that under these conditions the maintenance of a prompt and steady supply required carrying a heavy tonnage of cement in the depots. This once admitted, it was clear that orders should go to the Depot officers for filling to the best of their own judgment.

After having had experience both in the operation of the mills and in charge of the distribution from mills and depots, my judgment is that under the circumstances the Depot Section was entirely in the right on the main question. As matters were in 1918, it was an absolute necessity to carry the bulk of our supply at engineer depots, and to use the mills simply to supply local projects and as feeders for the depots. Transport conditions alone would have forced this conclusion; for supplies do not move automatically in time of war. The average cement shipment in the fall of 1918 required half a dozen telegraph or telephone calls at intermediate rail or canal points before it got through to its destination. And its final destination was in many cases very far away from the point to which it had been originally billed.

At any rate, it was thought advisable to secure closer co-operation between the mills and the depots; and to this end Capt. Eckel was in September, 1918, recalled from his command of the three companies on the Rhone, and placed in charge of the Cement Section of the Division of Military Engineering and Engineer Supplies. Since the chief of that division (at first Col. Boggs, later Gen. McIndoe) could of course order changes in mill operations through the E. P. O. at Paris, the entire question of cement supply and distribution could be controlled from the Tours headquarters. This proved to be fortunate, for almost at the outset of the new arrangement the danger of over-accumulation of cement called for prompt action. On receipt of the October 1st reports of cement tonnages at depots and mills, orders were telegraphed Paris to immediately stop any further importation of English cement. Even late in the Spring there had been danger of cement scarcity; but this had passed without notice into a condition of heavy over-supply.

Estimates *vs.* Consumption

This change had come about through a great and growing disparity between the estimates and the actual consumption of cement. For example, late in April, 1918, the Division of Construction and Forestry had estimated its requirements for May, June and July at 38,000 tons per month. This was about three times the monthly rate suggested by an estimate made a few months earlier; and the increased demand caused increased effort in the way of bringing over more English cement than had been planned, and also in the way of pushing work on the mills we had taken over in France.

But there had been many changes since April, and the trouble was that no one had bothered to consider what these changes meant in the way of decreased cement requirements. Much concrete construction had been given up; much more had been supplied with cement bought irregularly and casually. The result was that during May the D. C. and F. drew only 10,000 tons of cement from the depots, in place of the 38,000 tons that they had asked for; and later months showed no improvement in this respect.

As a matter of fact, from June 1st onward the period of uncertainty as to the cement supply was really over, though this fact was not clearly realized for several months more. From that date on the supply was always heavily in excess of the actual consumption, and in default of any centralized control, cement began to pile up at the depots and later at the mills. The thoroughly childish squabble between the Cement Section, E. P. O., and the Depot Section, O. C. E., had prevented any real co-operation; the Depot Section had kept calling for more cement, even when it was overloading the depots, and the Cement Section had kept buying and making more cement.

Accumulation of Surplus Supplies

At the close of October, 1918, there were approximately 60,000 tons of cement held in A. E. F. storage at the various mills and depots. Of this tonnage over 33,000 tons were at the depots, that of Nantes alone carrying more than 23,000 tons. This condition had arrived because the orders given early in October to cease importing English cement had not been obeyed promptly, so that over 12,000 tons of cement came in from England during October. The mills operated by the A. E. F. had also contributed heavily during that month.

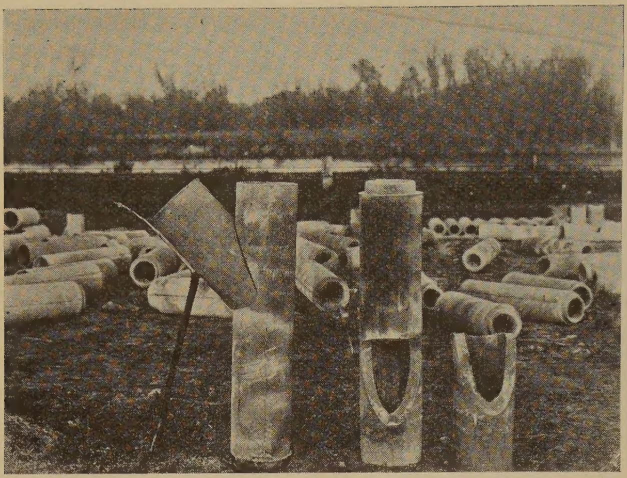

Fig. 3—Concrete Pipe Branch Connections as Molded at Guerville Mill—Y Branch, 45 Degrees, Cast in Two Sections

Photo by U. S. Signal Corps

As against this large supply, less than 10,000 tons of cement had actually gone into A. E. F. consumption during October; so that obviously we were still accumulating a heavy stock of old cement at both mills and depots. These conditions were recited in a communication to the Cement Section, E. P. O., with the further note that: "It is the judgment of this office (that is, D. M. E. and E. S.), after comparison of estimates and field requirements, that the cement used by the A. E. F. for the next four months will not exceed 10,000 tons per month, and may fall below 8,000 tons. On either basis we have now in stock more than a six months' supply. There is no possible danger of cement scarcity, but there is a practical certainty of a heavy loss through over-stocking. You are therefore directed to stop cement manufacture immediately at the Couvrot, Guerville, Beaumont and Le Teil mills. The two mills at La Souys and Mortagne can find use for their production for a month more at least." Being signed by a general, this order had some stopping power, so that just before the armistice we had managed to get the brakes set pretty well. The closing stage of the matter can be discussed later; here we may call attention to the phases of chief interest regarding distribution.

Location of Supply in France

The cement carried at depots and mills for A. E. F. utilization was scattered over the part of France occupied by our forces. The conditions which fixed the amounts carried at various points were as follows:

First of all, the English cement which, even to the close of hostilities, furnished the bulk of our supply, entered at Le Havre, St. Nazaire, or other Channel or Atlantic ports. Since Le Havre had practically no American construction, any cement entering there or at Rouen was normally sent in to the Engineer Depot at Paris, in charge of Lt. Mack. The small tonnages reaching Brest, La Pallice, etc., were ordinarily held at those ports temporarily, or else sent on to local projects. The heavy tonnage which entered the Loire, was sent up to our large warehouses at Nantes, in charge of Pvt. Straube; that entering Bordeaux went to the depot at St. Sulpice, in charge of Capt. Clarke.

From these primary depots requisitions were filled directly as far as possible, so as to save rehandling. But with the best intentions in this line it was necessary to carry always several thousand tons at the Gievres depot; and from 3,000 to 4,000 tons at Is-sur-Tille. This latter was held chiefly as an Army credit; and every attempt was made to keep the Is-sur-Tille supply of best fresh cement fit for front line work, if needed for that purpose.

Some idea of a typical distribution of our total supply can be secured from the reports as of October 31, 1918, which showed the following tonnages at various depots:

Paris	1,654
Brest	464
St. Sulpice	2,560
La Pallice (estimated)	100
Nantes	23,364
Gievres	1,485
Is-sur-Tille	4,054
	33,681

In addition to the above, the following tonnages were held at the various mills, subject to the order of the D. M. E. and E. S., at the same date:

Mortagne	1,915
La Souys	4,237
Couvrot (estimated)	10,500
Guerville	1,730
Beaumont (estimated)	3,000
Le Teil (hydraulic lime)	5,200
	26,582

Furthermore, there were at this date 5,000 tons of natural cement at Grenoble, and 2,000 tons grappier cement at Le Teil, under option to Lt. Col. Spackman, and available in case of need. The total thus in hand was a little over 67,000 tons.

Location of Demand

In order to give some idea of the distribution problem, the following summary from my notebook shows the condition of demand as of October 1, 1918. The tonnages opposite each point are the totals which would have to be supplied at or near that point during the three-months' period following:

	Tons
Brest	2,700
Bordeaux	8,050
St. Nazaire	5,050
Angers	1,250
Le-Mans	300
Montoir	600
Saumur	1,500
Tours	400
Romorantine	1,600
Gievres	4,700
Chateauroux	1,600
La Rochelle	950
L'Orient	300
Neufchateau	750
Dijon	700
Nevers	1,350
Mesves	2,750
Verneuil	1,500
Marseille	50
Mehun	4,550
Is-sur-Tille	3,100
Pauillac	500
Paris	2,750
Total, 3 months	47,000

Summaries of this sort, particularly when plotted graphically upon a base map of France, were of service in arranging both for mill operation and for depot storage. But two facts, of directly opposite tenor, had always to be borne in mind when making use of these generalized statements of condition. The first point was that some given locality might send in requisitions calling for all of its three months' estimate within a few weeks. The second and more common case was that most of them would not, at the end of the three months, have actually drawn more than a half or a third of their estimated requirements.

In order to check up the actual conditions and requirements, personal acquaintance with the various construction jobs was essential. The heads of the different services, which had originally made these demands for certain tonnages of cement, could not help out with data as to current conditions; they had dismissed the matter from their minds when the first estimates were made, and were now employed in reorganizing their office

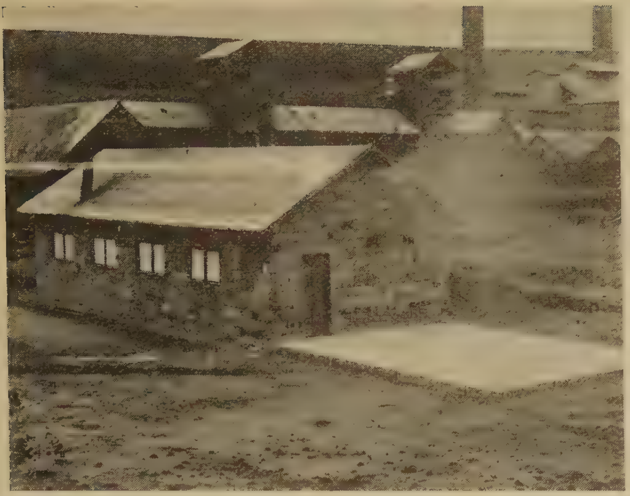

Fig. 4—Y. M. C. A. Buildings at Mortagne Cement Mill—Built by and for Cement Mill Co. No. 1

forces from day to day, so as to secure greater efficiency of the blueprint-chart sort. Thanks to the active interest taken in the matter by Col. Molitor, then Engineer Supply Officer, it was made possible for me to visit during October all the depots and all the important construction jobs then being carried on for the A. E. F. From the engineer officers in actual charge of these jobs it was always possible to get a frank statement as to their probable cement requirements, and as to their own facilities for receiving and storing cement on the job. During this last period we attempted to make greater use of the canals for certain deliveries, and we also tried to redistribute excess cement that was being held on certain jobs.

Manufacture of Molded Products

Mention may be briefly made here of the manufacture of various molded cement products undertaken by and for the A. E. F. This came about in consequence of demands along two widely different lines. First and most important, so far as tonnage was concerned, were the requirements of hospitals and other constructions for which pipe, tile, blocks, etc., were demanded by the engineers in charge. This type of work was carried on chiefly at the job, but the cement used for it was in all cases supplied from our own depots—because even if a French contractor were making the tile or pipe, he preferred our cement to any brand that he could buy in open market.

A certain fraction of the cement products was made in French yards; another portion was made by A. E. F. troops of local units; a final fraction was made by Companies 8 and 6 of the Engineer troops attached to the Cement Section. Of these Co. 6 had the Guerville mill; Co. 8 had been brought over in the late summer of 1918 by Lt. Warner. It was made up of volunteers and of men selected from the draft in the eastern cement districts, all of whom had had previous experience in some branch of the cement industry. It was trained in cement-product manufacture at Le Teil; and was later broken up into detachments and sent to make cement pipe and other products at Brest, Savenay and other points in need.

Finally, the First Army had a special cement-product plant at Liverdun, on the Moselle. This had been designed to make products for use in front-line work; it was built and operated by Co. C of the 24th Engineers, under Capt. Wilbur. It drew its cement supply from our depot at Is-sur-Tille.

Total Cement Acquired for the A. E. F.

There is considerable uncertainty regarding both the total tonnage of cement acquired for use by the A. E. F. and the total cement actually used by or for that organization. The estimates here presented represent the use of all the data I have been able to assemble on these subjects. They do not differ seriously in totals, it may be noted, from those given in a report made to the Chief of Engineers in early 1919; but I have now more definite proof regarding certain points which were then merely assumptions.

Assembling all the available data, the total tonnages secured for A. E. F. use were, as nearly as can be esti-

Fig. 5 — After the Armistice — Photograph Nov. 16, 1918, at the Couvrot (Marne) Cement Mill, Operated by A. E. F. Troops

Photo by U. S. Signal Corps

mated, as follows:

	Tons
Bought from French, Swiss and Spanish mills	42,000
Bought from English mills	120,000
Manufactured by A. E. F. in French mills	55,000
Total cement acquired for A. E. F.	217,000

If now we divide this total according to type or class of cement, we get figures about as follows:

	Tons
Portland cement	190,000
Hydraulic lime and grappier cement	20,000
Natural cements	5,000
Slag cement	2,000

These figures are very close for the portland total, and probably not far out anywhere. They represent, at any rate, the best estimate I can make, employing not only the records, but my own knowledge of what was in the depots and on the jobs at various times. Of the hydraulic lime total, 6,500 tons was made by the A. E. F.; the remainder was bought during 1917 and even 1918 by various persons.

The total cost of the 217,000 tons of cement supplied amounted to $6,700,000; this again being my own estimate from all available data. The average cost was therefore a little over $30 per ton; this will not surprise the reader if he keeps in mind that at the same time a very slaty coal, carrying at times 20% to 30% of ash, was being charged at $25 or so per ton. Counting in freight to rail points near the jobs, the total cost of the A. E. F. cement supply can be placed for convenience at some seven million dollars.

Tonnage Utilized by the A. E. F.

From the standpoint of the engineer estimating for future emergencies of similar type, the amount of cement that was acquired for A. E. F. use is of less interest than the amount of cement that was actually utilized by that organization. It is possible, I think, to estimate this latter amount with a sufficient degree of exactness.

After allowing for the tonnages lost by submarine and mine attack in the Channel (a total of some ten thousand tons), the amounts held in mills and depots on November 11, 1918, and the amounts which had previously been disposed of to the French government, we will not be far wrong in assuming that the A. E. F. used from their arrival in the early summer of 1917 up to the armistice in 1918 a total of between 150,000 and 160,000 tons of cement of all kinds.

Any further deductions must be more hazardous, because they will have to be based on personal judgment as to the future rather than upon completed work. But in the fall of 1918 I was in a position to form a fair estimate on this point, and it seems worth while, while we are still near to the actual events, to attempt a further estimate as to total probable utilizations. To judge from the work in progress when the armistice arrived, and from the orders then cancelled, it seems likely that 60,000 tons more of cement would have been sufficient to carry out and complete all the basal construction program of the A. E. F., even in its original broad scope. After that program had been completed, it is questionable if the American armies, operating in the hard-rock sectors of eastern France, would have used as much as 3,000 tons per month of cement for front-line work. And they would not have approached even this figure unless the war had reverted to the semi-static trench warfare of the earlier years, or unless prolonged and formal siege operations had become necessary against either the Metz-Thionville area or against the Rhine bridge-heads.

It is estimated that the total cement supply of the A. E. F. up to November 11, 1918, had cost some seven million dollars. It is further estimated that of this total some four and a half million dollars had been profitably employed up to that date; and that the total wastage and loss, up to the armistice, did not exceed half a million dollars. The remaining cost, some two million dollars, was represented by stocks carried at mills, depots and elsewhere on Armistice Day. These figures are of course merely approximations, but they represent the best that can be done in the absence of any really exact data on some of the vital points.

The important fact, in the present connection, is that on November 11 this stock was worth more than the two million dollars that had been paid for it. We could have sold it all at a profit to French civilian contractors, who for four years had been prevented from buying sufficient cement to fill the ordinary civilian requirements. But to make such sales involved getting permission from both American and French authorities, and this proved impossible.

The only thing that remained was to prevent further loss. Acquaintance with mill, depot and climatic conditions suggested that the depreciation would range between 5% and 10% a month. These facts were stated to the proper authorities; the necessity for prompt sale was emphasized, and there the matter passed into other hands.

By the end of 1918, as Col. Longley had very opportunely offered me a chance to take charge of the investigation and valuation of oil well and mine damages in Roumania, the new assignment was very gratefully accepted. Col. Spackman had, I believe, given up the Cement Section, E. P. O., at a somewhat earlier date; and during the early days of 1919 the officers and men left at the various mills and depots were slowly withdrawn. After that details are lacking; it is assumed that the heavy cement tonnage still on hand was finally turned over to the French government as part of the final lump-sum sale—or donation—which closed the history of the A. E. F. in France.

Cement Securities and Alpha Abandon Consolidation Plan

The abandonment of the proposed plan for the consolidation of the Cement Securities Co. and the Alpha Portland Cement Co., which has been in contemplation for about a year, has been announced by Charles Boettcher, president of the Cement Securities Co. and chairman of the committee on consolidation. Under the proposed agreement, it was provided that unless the plans were declared operative within a year after its original date, it should be considered as having been abandoned.

In his letter to the stockholders Mr. Boettcher stated that the situation outlined in March, 1921, had not developed to a point where such conclusions might be drawn as to justify the committee in accepting the proposed consolidation. From the standpoint of the Cement Securities Co. it was considered undesirable to becloud the issues involved in the dissolution proceedings recently instituted in the United States District Court at Denver by a consolidation with any other company.

The statement is repeated in the letter that the officers of the Cement Securities Co. are confident that the final outcome of the legal proceedings will be a complete vindication in all matters upon which the charges are based.

The committee in charge of the consolidation has instructed the Denver National Bank, depositary, to deliver to the holders of the deposit certificates the shares of stock of the Cement Securities Co., upon surrender of their deposit certificates, and all negotiations have been definitely terminated.

Cement in 1920: A Review[1]

By Robert W. Lesley
Past President of the Portland Cement Assn.

The 100,000,000-bbl. mark in production, which has long been aimed at by the manufacturers, was reached in the year 1920. During the same period a marked advance in the price of cement was shown, the figure of $2.02 being the highest reached since 1881. With these two conditions obtained, it would seem that of necessity the year 1920 would have been a red-letter one in the history of the portland cement industry, yet in looking over the year in retrospect it is doubtful if the producers secured even reasonable profits for the strenuous work done during the period in question. During the winter months there were continuous seasons of snow and ice, hampering production and transportation to an extraordinary degree, and when the spring business began to open in April a railroad strike covering the greater part of the country tied up mills and almost put a stop to shipments. As a result there was a great dearth of cars in June and July, so much so that in many of the eastern mills flat cars with canvas tarpaulins were used to convey the cement from mill to consumer. These conditions caused no little inconvenience to the manufacturer, and great annoyance to the consumer, and when the strike and the car shortage were over it was everyone's expectation that cement would be in abundance for the work offered.

The railroad strike, however, was succeeded by a coal shortage, and in July mills in the East were paying as high as $12.50 at the mines for coal, which in the early part of the year had been bought as low as $3.00. The result of all this was to make cement a very scarce commodity, and to advance the price, while the manufacturers, dealing with high coal and high labor, were able to get little return from their investments. While the midsummer and autumn months of 1920 indicated a serious shortage in cement, as a matter of fact there were 115 plants in operation in that year, as compared with 111 active plants in 1919, one additional works each having operated in the States of Alabama, Indiana, New York, and Oregon; and in addition to this, the productive capacity of the cement mills of the United States is estimated at between 130,000,000 and 140,000,000 bbls. so that the shortage which occurred, as above stated, was due to conditions extraneous to the producers themselves.

Table 1 gives the various hydraulic cements shipped in the years 1918, 1919, and 1920.

Table 2 shows the portland cement produced, shipped and in stock in the United States in 1919 and 1920 by districts.

Table 3 shows the portland cement produced, shipped and in stock in the United States in 1919 and 1920 by States.

From Table 5, which shows the statistics as to fuel used in burning cement, the large preponderance of coal as a fuel will be noted, and the figures show that relatively the same percentage of plants used coal as a fuel in 1920 as in 1919, the figures being 81.6% of the total in 1919 and 81.2% in 1920. There was a slight increase in the number of plants using crude oil, possibly due to the high prices and difficulty of obtaining coal.

As a result of the shortage, especially in certain parts of the country, the year 1920 shows a large increase in the number of barrels of cement imported into the United States, the figures being 498,036 bbls., valued at $1,229,431, or $2.47 per bbl. This is a surprising figure, when contrasted with the imports in 1918 of 302 bbls., and in 1919 of 8,454 bbls. This increase of imports, however, is made up by a corresponding increase in exports, which during the same period amounted to 2,985,807 bbls., valued at $10,045,369, or $3.36 per bbl. The exports for the year exceeded those of 1919 by 522,118 bbls.

It is a matter of congratulation to note the increase in exports in the face of the cement shortage in the United States, proving, as it does, that the American manufacturers were determined to maintain the market which they had been establishing in foreign countries.

From the figures given it will be noted that the percentage of increase in quantity of barrels produced was 24%, while the percentage of increase in shipments was 13%, and that the average increase in factory price per barrel was 17½%. So far as production is concerned, the very large increases were in the districts covering the Far West and the Pacific Coast States, though New York, Illinois, and Western Indiana also show considerable gain. Taking the districts in another way, it will be noted that the Lehigh district, comprising eastern Pennsylvania and western New Jersey, which has always been the largest single producer of cement, showed an increase of only 12%, as compared with the general average increase of 24%, and its share in the total of 100,000,000 bbls. was just about 25%, as compared with figures in past years of nearly 30% of the total output of the countrk. The largest increases in price were shown in Michigan, the northeastern Indiana district, the Rocky Mountain and the Pacific Coast States, and Tennessee, Alabama and Georgia, where evidently the cement shortage was most acute.

TABLE 1.—FRINCIPAL HYDRAULIC CEMENTS SHIPPED FROM FACTORIES IN THE UNITED STATES. (a)

Class.	1918.		1919.		1920.	
	Quantity (Barrels).	Value.	Quantity (Barrels).	Value.	Quantity (Barrels).	Value.
Portland	70,915,508	$113,153,513	85,612,899	$146,734,844	96,311,719	$194,439,025
Natural Pussolan	432,966	401,341	528,589	583,554	767,481	1,150,890
Total	71,348,474	$113,554,854	86,141,488	$147,318,398	97,079,200	$195,589,915

(a) U. S. Geol. Surv.

Again the figures of production per capita show an increase, but are still below those for 1916. They are as follows:

Year	Bbls.	Year	Bbls.
1914	0.77	1918	0.64
1915	0.83	1919	0.78
1916	0.89	1920	0.84
1917	0.84		

Table 4 shows the average price per barrel of portland cement from 1870 to 1919, and it is interesting to note that the 1920 figures are the highest since 1881, when the American portland cement industry was just beginning to exist, and is slightly above the average of prices from 1883 to 1892, which marked the formative

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[1] From *Mineral Industry.*

TABLE II.—PORTLAND CEMENT PRODUCED, SHIPPED, AND IN STOCK IN THE UNITED STATES, BY DISTRICTS. (a)

Commercial District.	Production.								
	Active Plants.		Quantity (Barrels).		Percentage of Increase.	Stock (Barrels).			
	1919.	1920.	1919.	1920.		1919.	1920.	Percentage of Change.	
Lehigh district (eastern Pennsylvania and western New Jersey)	20	20	22,747,956	25,417,804	+12	1,626,053	2,086,370	+28	
New York	8	9	4,383,579	5,885,058	+34	721,304	553,989	−23	
Ohio and western Pennsylvania	8	8	6,599,820	7,343,112	+11	347,292	752,582	+117	
Michigan and northeastern Indiana	12	13	5,047,395	5,379,187	+ 7	273,641	727,927	+166	
Kentucky and southern Indiana	3	3	2,490,497	3,293,090	+32	99,626	326,193	+227	
Illinois and western Indiana	6	6	9,088,081	13,106,011	+44	322,190	1,094,358	+240	
Maryland, Virginia, and West Virginia	4	4	2,469,768	3,044,691	+23	124,093	256,476	+107	
Tennessee, Alabama, and Georgia	4	6	2,744,646	2,888,811	+ 5	37,235	191,319	+414	
Iowa, Minnesota, and Missouri	10	10	10,038,625	12,406,745	+24	366,331	1,261,131	+244	
Nebraska, Kansas, Oklahoma, and central Texas	15	15	6,151,095	8,177,245	+33	460,365	727,726	+58	
Rocky Mountain States (Colorado, Utah, Montana, and western Texas)	8	8	2,811,843	3,764,502	+34	221,119	251,236	+14	
Pacific Coast States (California, Oregon, and Washington)	13	15	6,204,630	9,316,989	+50	657,651	711,739	+ 8	
	111	117	80,777,935	100,023,245	+24	5,256,900	8,941,046	+70	

Commercial District.	Shipments.					Average Factory Price Per Barrel	
	1919.		1920.		Percentage of Change in Quantity.		
	Quantity (Barrels).	Value.	Quantity (Barrels).	Value.		1919.	1920
Lehigh district (eastern Pennsylvania and western New Jersey)	23,501,560	$38,511,273	24,953,127	$47,875,881	+ 6	$1.64	$1.92
New York	4,441,250	7,700,406	6,049,150	12,206,698	+36	1.73	2.02
Ohio and western Pennsylvania	7,102,442	12,144,272	6,943,400	13,414,249	− 2	1.71	1.93
Michigan and northeastern Indiana	5,459,439	9,274,025	4,922,329	11,892,249	−10	1.70	2.42
Kentucky and southern Indiana	2,640,556	4,405,939	3,069,407	6,248,406	+16	1.67	2.04
Illinois and western Indiana	9,932,158	16,092,758	12,321,840	22,561,398	+24	1.62	1.83
Maryland, Virginia, and West Virginia	2,613,963	4,517,591	2,912,308	6,128,117	+11	1.73	2.10
Tennessee, Alabama, and Georgia	2,830,588	4,952,245	2,730,420	6,010,436	− 4	1.75	2.20
Iowa, Minnesota, and Missouri	11,440,645	19,314,646	11,511,954	22,259,081	+ 1	1.69	1.93
Nebraska, Kansas, Oklahoma, and central Texas	6,309,024	11,662,504	7,900,247	17,110,729	+25	1.85	2.17
Rocky Mountain States (Colorado, Utah, Montana, and western Texas)	2,982,048	5,939,933	3,734,784	8,316,576	+25	1.99	2.23
Pacific Coast States (California, Oregon, and Washington)	6,359,226	12,219,252	9,262,753	20,415,205	+46	1.92	2.20
	85,612,899	$146,734,844	96,311,719	$194,439,025	+13	$1.71	$2.02

(a) E. F. Burchard, U. S. Geol. Surv.

TABLE III.—PORTLAND CEMENT PRODUCED, SHIPPED, AND IN STOCK IN THE UNITED STATES, BY STATES. (a)

State.	Production.							
	Active Plants.		Quantity (Barrels.)		Percentage of Increase.	Stock (Barrels).		Percentage of Change.
	1919.	1920.	1919.	1920.		1919.	1920.	
California	8	9	4,642,679	7,098,084	+53	430,003	463,930	+ 8
Illinois	4	4	4,206,918	5,538,558	+32	25,125	403,640	+1507
Indiana	5	6	7,262,454	10,787,751	+49	448,451	1,047,960	+ 134
Iowa	4	4	3,573,278	4,849,228	+36	126,162	553,607	+ 339
Kansas	7	7	2,927,270	4,340,794	+48	220,994	399,059	+ 81
Michigan	11	11	4,675,244	4,891,457	+ 5	219,641	666,071	+ 203
Missouri	5	5	5,216,347	6,017,517	+15	160,123	571,697	+ 257
New York	8	9	4,383,579	5,885,058	+34	721,304	553,989	− 23
Ohio	5	5	1,637,418	1,780,433	+ 9	82,468	197,521	+ 140
Oklahoma	3	3	1,362,687	1,553,652	+14	71,908	134,438	+ 87
Oregon and Washington	5	6	1,561,951	2,218,905	+42	227,648	247,809	+ 9
Pennsylvania	21	21	25,325,173	28,269,314	+12	1,781,997	2,388,836	+ 34
Texas	5	5	2,249,735	2,562,208	+14	205,918	143,502	− 30
Utah	3	3	819,861	1,093,741	+33	34,295	105,397	+ 207
Other States (b)	17	19	10,933,341	13,136,545	+20	500,863	1,063,590	+ 112
	111	117	80,777,935	100,023,245	+24	5,256,900	8,941,046	+ 70

State.	Shipments.					Average Factory Price Per Barrel.	
	1919.		1920.		Percentage of Change in Quantity.		
	Quantity (Barrels).	Value.	Quantity (Barrels).	Value.		1919.	1920.
California	4,743,336	$8,860,196	7,064,010	$15,449,645	+49	$1.87	$2.19
Illinois	4,873,831	7,901,689	5,148,040	10,012,158	+ 6	1.62	1.94
Indiana	7,667,976	12,527,770	10,191,126	18,649,115	+33	1.63	1.83
Iowa	4,569,110	7,798,347	4,421,783	8,742,854	− 3	1.71	1.98
Kansas	3,023,901	5,467,284	4,158,399	8,649,157	+38	1.81	2.08
Michigan	4,990,308	8,468,196	4,442,455	10,939,633	−11	1.70	2.46
Missouri	5,496,164	9,264,017	5,605,952	10,980,453	+ 2	1.69	1.96
New York	4,441,250	7,700,406	6,049,150	12,206,698	+36	1.73	2.02
Ohio	1,821,597	3,311,179	1,670,958	3,561,490	− 8	1.82	2.13
Oklahoma	1,366,884	2,657,339	1,484,698	3,284,412	+ 9	1.94	2.21
Oregon and Washington	1,615,890	3,359,056	2,198,743	4,965,560	+36	2.08	2.26
Pennsylvania	26,250,077	43,126,528	27,662,116	52,632,082	+ 5	1.64	1.90
Texas	2,318,747	4,226,222	2,626,130	5,898,972	+13	1.82	2.25
Utah	935,305	1,906,816	1,022,639	2,314,413	+ 9	2.04	2.26
Other States (b)	11,498,523	20,159,799	12,565,520	26,152,383	+ 9	1.75	2.08
	85,612,899	$146,734,844	96,311,719	$194,439,025	+13	$1.71	$2.02

(a) E. F. Burchard, U. S. Geol. Surv.
(b) Alabama, Colorado, Georgia, Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey, Tennessee, Virginia, and West Virginia.

TABLE IV.—AVERAGE PRICE PER BARREL OF PORTLAND CEMENT, 1870-1920

1870–1880	$3.00	1896	$1.57	1909	$0.813
1881	2.50	1897	1.61	1910	0.891
1882	2.01	1898	1.62	1911	0.844
1883	2.15	1899	1.43	1912	0.813
1884	2.10	1900	1.09	1913	1.005
1885–1888	1.95	1901	0.99	1914	0.927
1889	1.67	1902	1.21	1915	0.860
1890	2.09	1903	1.24	1916	1.103
1891	2.13	1904	0.88	1917	1.354
1892	2.11	1905	0.94	1918	1.596
1893	1.91	1906	1.13	1919	1.690
1894	1.73	1907	1.11	1920	2.020
1895	1.60	1908	0.85		

TABLE V.—STATISTICS SHOWING FUEL USED IN BURNING PORTLAND CEMENT (a)

Fuel.	1919.				1920.			
	Number of Plants.	Number of Kilns.	Barrels.	Percentage of Total.	Number of Plants.	Number of Kilns.	Barrels.	Percentage of Total.
Coal	90	596	65,877,185	81.6	96	629	81,265,667	81.2
Coal and oil	3	32	6,985,271	8.6	1	24	6,676,029	6.7
Coal and gas	2	9			1	6		
Oil	14	73	6,634,775	8.2	16	79	9,495,798	9.5
Coal, oil and gas	1	5	1,280,704	1.6	2	9	2,585,751	2.6
Natural gas	1	5			1	6		
Total	111	720	80,777,935	100.0	117	753	100,023,245	100.0

(a) U. S. Geol. Surv.

TABLE VI.—IMPORTS OF FOREIGN CEMENT, IN BARRELS OF 380 LB.

1885	554,396	1897	2,090,924	1909	443,888
1886	915,255	1898	1,152,861	1910	306,863
1887	1,514,095	1899	2,108,388	1911	164,670
1888	1,835,504	1900	2,386,683	1912	68,503
1889	1,740,356	1901	939,330	1913	85,470
1890	1,940,186	1902	1,963,023	1914	120,906
1891	2,988,313	1903	2,251,969	1915	42,218
1892	2,440,654	1904	968,409	1916	1,836
1893	2,674,149	1905	896,845	1917	2,323
1894	2,638,107	1906	2,273,493	1918	302
1895	2,997,395	1907	2,033,438	1919	8,454
1896	2,989,597	1908	842,121	1920	498,036

TABLE VII.—EXPORTS OF CEMENT, IN BARRELS

Year.	Quantity.	Value.	Percentage of Total.	Year.	Quantity.	Value.	Percentage of Total.
1904	774,940	$1,104,086	2.4	1913	2,964,358	$4,270,666	3.2
1905	897,686	1,387,906	2.2	1914	2,140,197	3,088,809	2.4
1906	583,299	944,886	1.1	1915	2,565,031	3,361,451	3.0
1907	900,550	1,450,841	1.7	1916	2,563,976	3,828,231	2.7
1908	846,528	1,249,229	1.6	1917	2,586,215	5,328,536	2.8
1909	1,056,922	1,417,534	1.6	1918	2,252,446	5,912,166	3.2
1910	2,475,957	3,477,981	3.2	1919	2,463,573	7,513,389	2.9
1911	3,135,409	4,632,215	3.9	1920	2,985,807	10,045,362	3.0
1912	4,215,532	6,160,341	5.1				

period in the industry when it was gradually fighting its way against European imports.

SCIENTIFIC DEVELOPMENT

The Joint Committee on Specifications for Concrete and Reinforced Concrete held a number of meetings during the year and made material progress in the field of its work. Announcement was made at one of the late meetings that it was hoped that at the June, 1921, meeting of the American Society for Testing Materials a tentative specification dealing with this important subject would be ready to be presented.

The long-discussed subject of fineness for portland cement was finally brought to a conclusion as a result of numerous meetings between Government engineers and the committees having to do with specifications for portland cement. As a result of this agreement the cement specification of the American Society for Testing Materials was finally put in form and in its finished state was adopted as one of the earliest standards of the American Engineering Standards Committee.

In connection with cement specifications, it is to be noted that during the year new specifications were issued by the English Standards Committee (consisting of representatives of the Government and the various engineering societies of England), and by the Japanese Government through its Departments of Agriculture and Commerce.

The year was also marked by important investigations conducted by the engineering societies and individual engineers in the field of concrete and reinforced concrete, and especially in the field of aggregates and requisite amounts of water required to produce ideal concrete mixtures. In this field much interesting work was done by the Lewis Institute of Chicago, in connection with the laboratory of the Portland Cement Association, under the direction of Dr. Duff A. Abrams.

With the cessation of war conditions and the constant demand for new ships, the construction of concrete ships, barges, etc., dwindled away into nothing, and while in Europe there is still some work being done in this field, production has practically ended for the present in the United States.

A similar statement may be made in connection with the production of potash as a by-product of cement manufacture. The closing of German importations, owing to war conditions, had a tendency to develop a demand at very high prices in this country for potash. This was met during the war times by several cement manufacturers who equipped themselves for the recovery of the potash to be found in the cement dust going up from the kiln stacks. By the use of the Cottrell and other methods of dust recovery a considerable amount of potash was obtained, which was marketed at prices from $300 to $400 per ton, and at least one mill, which was earliest in the field, produced a very handsome income by the recovery of this by-product. Since the German and French competition has begun again, the price of potash has dropped so that there is little to be gained in this field in the cement industry at present, though in some cases the existing machinery is used for the recovery of dust hitherto going up through the stacks.

Much good work was done during the year in connection with various methods of economical cement manufacture, and owing to the particular attention that was called to the fuel question by the great advance in coal prices, much of this work was in the field of coal economy. Many additional waste-heat boilers were installed for the use of kiln gases in steam production, while other interesting researches were made in the direction of lessening the radiation from the rotary kilns and in saving the heat going out with the hot clinker with the cooling.

Concrete construction of houses was a marked feature of the year 1920, both in this country and in England. Over 3,500 concrete houses were erected in England by private persons, with the aid of Government housing subsidies, while in the United States numerous industrial establishments in various parts of the country adopted concrete as a material for their housing operations, and hundreds of houses of this type were constructed.

An important feature of the year was the great increase in appropriations for concrete roads, and the increasingly successful development of this form of highway. As a result it may be stated that great improvements in road making, so far as scientific and economical construction are concerned, were made.

While the year was marked by several cement mergers and by the broadening of the field of some of the larger companies through the purchase of additional plants, it was also marked by legislation in many States authorizing the construction of portland cement works with State funds. Several of these were planned during the year, and it is expected that in 1921 funds would be provided and construction begun, though in some of the States considerable opposition was manifested to the plans proposed.

CEMENT ACTIVITIES IN FOREIGN FIELDS

Argentina—The plant of the Compania Argentina de Cimento Portland, which is operated by the International Portland Cement Co., of New York, is located in the heart of the province of Buenos Aires, at a distance of about 8 hours by train from the latter city. It has a capacity of 3,000 bbls. a day and uses petroleum as a fuel.

Austria—In consequence of more plentiful fuel, the Austrian cement industry has been able to increase production for 1920 by approximately 20%. The output for the year will amount to 120,000, or possibly 130,000 tons. This is far below the capacity of the industry, and only about 22% of the normal needs of the region now comprised within Austria. It is expected that exporting will be resumed, at least to some extent, during 1921.

Belgium—Reconstruction work in Belgium and in Northern France has made such large demands for cement that there is none to export. Owing to the war the capacity of the mills has been reduced by the destruction and dismantling of plants from 250,000 to 500,000 bbls. per month, and the Associated Belgian Portland Cement Manufacturers, embracing 14 plants, expect that there will be little or no Belgian cement for export before the spring of 1922.

Canada—The Canada Cement Co., in its report for 1920, shows that only 3.1% was earned, applicable to the $13,500,000 common stock, against 6% distributed, with the result that after the dividends and reserves there was a deficit of $525,885, which reduced the general surplus to $898,972. Net for 1920 was $2,362,742, against $3,057,553 in 1919.

Coal last year was 540% more than in 1914, and labor advanced 145%. The average price of all commodities entering into the manufacture advanced 196%, and the selling price advanced only 90%.

Chile—It is reported that a company called the Arica Cement Co. is to build a cement works in Chile near the port of Arica. A capacity of 150,000 bbls. of cement per annum is proposed, and a capital of $1,000,000 is being raised for the purpose.

China—A Chinese cement company, located at Tongshan, Chihli province, on the Peking-Mukden Railway, controls the cement industry of North China. The factory was established in 1906, and is equipped with modern machinery. Limestone exists on the site of the works. The product is gray Portland (no white), and both wet and dry processes are used, with large rotary kilns. The normal output is 600,000 bbls. per annum, but in 1918 the output was 800,000 bbls. Foreign markets have principally been Java and the Philippine Islands, and locally the product is mostly used by the railways and mines.

England—Since the war the English industry has had a period of good shipments at high prices. It suffered in 1920 from continuing advances in coal prices, accompanied by a constant falling off in the quality, caused by careless mining and screening, which gave much waste in the fuel delivered.

The English exports before and since the war are given below.

	Quantity Long Tons	Value, f.o.b.	Average Value Per Ton s.	d.
1913	747,736	£1,273,080	34	6
1919	385,526	2,050,336	106	4
1920:				
Jan.—March	130,771	713,370	109	1
April—June	149,770	848,547	113	4
July—Sept.	174,055	1,078 847	124	0

The increase in exports has been accompanied by a very substantial increase in output.

Much progress has been made in the work of the British Portland Cement Research Association, an organization embracing the leading scientists of the industry and modeled in a general way upon the technical section of the American Portland Cement Association.

Esthonia and Livonia—The Rega Cement Factory, in Livonia, employs 1,500 men and has a capital of 2,250,000 rubles, while two plants in Esthonia employ 1,500 men and have a combined capital of 5,000,000 rubles.

Finland—There are two portland cement factories in Finland. One of them, the Pargas, Kalkbergs Aktie-Bolag, located at Pargas, has a joint-stock capital which was increased in 1919 from 10,000,000 marks to 15,000,000 marks, and has a production capacity of 450,000 bbls. a year, with machinery capable of increasing this to 900,000 bbls. a year. The other factory is the Lojo Kalkverks Aktie-Bolag, located at Lojo. It has a joint stock capital of 3,800,000 marks, and a production capacity of 225,000 bbls. per annum, which will soon be doubled. Besides making cement, both of these companies carry on the breaking of limestone and the manufacturing of lime, most of which has been used by the cellulose factories, the sales for agricultural use having been insignificant.

During the year 1919 the cement factories in Finland worked only for home consumption, and the sales were small, because of the limited building activity. No cement or lime was exported, as such export was prohibited, but some cement was imported from Esthonia.

France—Reconstruction work in the devastated regions has kept French cement manufacturers busy in 1920. While there have been but few new plants put in operation, much work has been done in the way of improving and reconstructing the existing ones. Continuous automatic vertical kilns have been added in some cases, and in the great La Farge works a molten-clinker process has been introduced.

French Indo-China—The portland cement works at Haiphong have been very busy during the war, and have a capacity of 125,000 bbls. annually, which it is proposed to increase to meet growing demands for portland cement in the Orient. This increase will be 60,000 tons annually.

Germany—Government operation of the German cement industry, put into effect on January 1, 1917, was provisionally dispensed with on July 27, 1920, and manufacturers resumed control of their plants.

The price of cement in Germany at the outbreak of the war was 35 marks per ton for both Government and private contracts. Following the establishment of Government operation of the cement industry and the accompanying official regulation of prices, there was a rapid rise in the cost of this commodity. The following prices per ton (f. o. b. mill and exclusive of packing) show the course of these prices since 1914:

Periods Periods	On government contracts Marks	On private contracts Marks
Aug. 1, 1914.....................	35	35
Jan. 1, 1917.....................	43	43
Oct. 1, 1918.....................	73	76
Apr. 1, 1919.....................	88	91
Apr. 1, 1920.....................	390	406
Aug. 1, 1920.....................	333	340

During the middle of last summer the production of cement was somewhat increased, due in part to the resumption of operations by the Offenbacher Portland-Zementfabrik (Gruppe der Portland-Zementwerke, Heidelberg-Mannheim-Stuttgart) after lying idle for a period of more than five years. The cement industry in Germany has not felt the effect of the coal shortage as much as other lines of manufacture, for the reason that the mills were, to a considerable extent, able to use low-grade coal. Germany has resumed the shipment of cement to foreign markets.

Coal and car shortage have caused considerable trouble for the manufacturers, but in some foreign markets German cements are already beginning to appear, indicating that some of the prevailing difficulties have to some extent been overcome.

India—It is reported that a new cement factory, capitalized at $650,000, is to be erected at Beleli, a station on the Northwestern Railway, which is eight miles from Quetta, the capital city of Baluchistan.

Jamaica—A portland cement works is being planned for the island by an English syndicate, to use the available materials for the manufacture of a high class cement. It is expected it will be used in Jamaica itself for railroad and other works, and the surplus product exported to the neighboring countries of South America.

Japan—The following figures, in barrels, will give some idea of the increase in production of portland cement in Japan and of the demand of the export trade for the Japanese product:

	Output	Export	Export to Colonies
1913	3,741,000	149,000	147,000
1914	3,625,000	258,000	174,000
1915	3,943,000	677,000	253,000
1916	4,495,000	674,000	268,000
1917	5,501,000	533,000	382,000
1918	5,960,000	900,000	264,000
1919	6,500,000	997,000	258,000

As will be seen from the above table, the export of cement for 1913, or the year preceding the outbreak of war, occupied only 4% of the entire production. But the volume of export increased to 258,000 bbls. in 1914, in which year the war broke out, 677,000 bbls. in 1915, and little less than 1,000,000 in 1919, or over 15%. This tremendous increase in the export of cement since the war is due to the fact that as the war progressed, the belligerents in Europe became unable to continue to meet the demands in the South Seas, India and Australia and other large consumers of cement, as they were compelled to devote their energies to the manufacture of war materials. As for the export to the colonies, it has also been yearly increasing, Korea being the largest consumer.

The enormous increase in demands for cement material brought the price up to a considerabde extent, increasing it about 3 yen per bbl. in pre-war days to as much as 17 yen per bbl. in March and April of 1920.

From the effect of the financial convulsion the prices since then have gone down as low as 12 to 13 yen.

There are twelve principal cement works in the country, whose capacity has increased from 32,000,000 yen in 1914 to 44,600,000 yen at the end of 1920.

Jugo-Slavia—There are six cement factories in Dalmatia, with a production of about 500,000 tons per year, principally controlled by Italian capitalists. They have been paying good dividends since they started producing in 1919—25% to 40%. The rest of Serbia has five factories, producing an additional 500,000 tons. At the present time there are several English capitalists who are conducting negotiations for the purchase of the largest of these factories.

For the portland cement industry, the ideal location is Dalmatia, because the raw material is located not 100 yds. from the shore, so that Italian factories are importing raw material over the Adriatic Sea.

Dalmatian cement is known very favorably in South America and the Near East, where it was exported before the war. The cement would cost less than $4 per ton. Native labor is available at low rates, in view of the exchange, and lumber for barrels is also cheap.

New South Wales—The production of portland cement in 1920 amounted to 143,887 long tons, an increase of 8,046 tons over the preceding year.

Poland—Poland's normal output of 1,750,000 bbls. has been reduced about 20% by the war. Owing to car shortage, shipments have been held up and stock houses are reported to be filled with cement.

Spain—Of the 401,017 tons of cement produced in Spain in 1918, 186,713 tons was natural cement proceeding from 44 plants, 10 of which were in the province of Barcelona, 10 in the province of Gerona, and 9 in the Balearic Islands. The cement works of the province of Barcelona yielded 86,730 tons of the total of 214,304 tons of portland cement produced during 1918.

By a recent royal order cement is made dutiable for both import and export.

Switzerland—The year 1920 was a bad one for the Swiss cement industry, as capital was timid about engaging in building enterprises and little construction was done. No success attended the efforts of Swiss manufacturers to penetrate peacefully the German and French markets, and in the face of large reduction in price the output was barely 52% of the manufacturing capacity.

Tasmania—A portland cement works will be projected on Maria Island, off the east coast of Tasmania, where cement making materials are found in abundance. The capital is from one to one and a half million dollars, and it is estimated that the output will reach from 30 to 50 tons when the plant is completed.

Uruguay—The International Portland Cement Co., of New York, operates a large plant in the city of Montevideo, in the Republic of Uruguay.

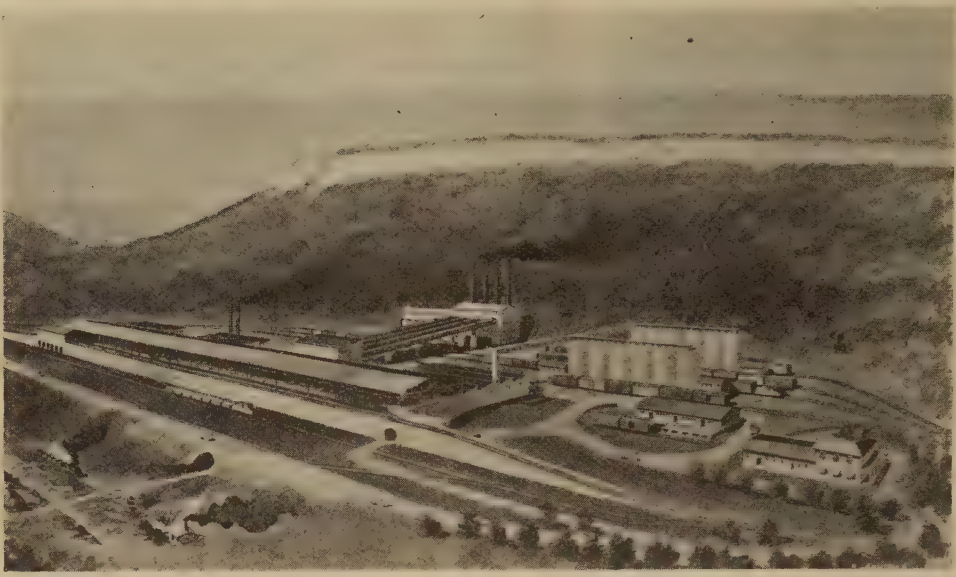
Government Brings Suit Against Cement Securities Co.

The government has brought suit under the Sherman anti-trust law against the Cement Securities Co., of Denver, its six subsidiary cement manufacturing companies, and their officers and directors, charging them with having entered into a combination to restrain and monopolize trade and commerce in portland cement in states comprising the Rocky Mountain region. The petition was filed at Denver on January 10 by the United States attorney, acting under instructions from the Attorney General.

"It is stronger than the New York cases, in which civil suits were filed and indictments brought, and is another in a series of similar suits which is planned in accordance with particular industrial groups and geographical districts," Attorney General Daugherty declared in announcing that the suit had been brought.

The suit is directed against the Cement Securities Co., of Denver, the Colorado Portland Cement Co., Union Portland Cement Co., Three Forks Portland Cement Co., the United States Portland Cement Co., Oklahoma Portland Cement Co., and Nebraska Cement Co., having mills for the manufacture of portland cement in the states of Colorado, Utah, Montana, Oklahoma, and Nebraska. The following individuals, who are officers and directors of the several corporations, also are named: Charles Boettcher, Claude K. Boettcher, John H. Porter, Harry C. James, R. J. Morse, J. E. Zahn, A. W. Kirkpatrick, and F. R. Schmidt, all of Denver; Carl Leonardt, of Los Angeles; M. D. Thatcher, of Pueblo, Colo.; James Pingree, of Ogden, Utah; J. D. Slemons, of Butte; C. D. Nichols, of Oklahoma City; E. E. Bruce, of Omaha; C. F. Seibold, of Danbury, Iowa, and Murrell O. Matthews, of Oklahoma City.

The government charges that the real purpose for which the Cement Securities Co. was organized was to eliminate competition between cement manufacturing companies in which certain of its promoters were interested; to acquire and absorb or dismantle independent mills, thereby further eliminating competition; to attain a monopoly of the portland cement industry in the so-called Rocky Mountain states; and having obtained such a monopoly, to insure its territory against invasion by potential competitors situated in the states adjoining the Rocky Mountain states.



A Perspective View, Showing How the Plant of the Signal Mountain Cement Co. Will Appear When Completed

Work Started on Signal Mountain Plant

Work has been started on the construction of a modern cement plant, on the property of the Signal Mountain Portland Cement Co., near Chattanooga, Tenn. Detailed plans for the building of the plant have been completed and construction work is under the supervision of A. C. Deer, who is also general manager of the Peninsular Portland Cement Co., of Cement City, Mich. The plant will have a capacity of 5,000 bbls. of portland cement per day, and it is estimated that the work of building will furnish employment for about 300 men.

According to statements attributed to Mr. Deer, the plant will be the most modern cement plant in the South, since no cement plants have been constructed in that section within the last 10 years, during which time science has made many strides in the matter of cement plant machinery. It is estimated that the expense of running the new plant will be reduced materially as compared with the expense of operation of the other plants built 10 years ago. It is planned to operate the plant with 130 men, whereas about 300 men would ordinarily be required to operate one of the older plants of similar capacity.

The new plant will be located about five miles from Chattanooga, on the Tennessee River. There is about a mile of water front along the company's property, and the land slopes from the river upward and lies along the mountain side. The officers of the company regard the location as peculiarly fortunate, not only because of the proximity of the raw material on the mountain side, but also because of the economic value of the transportation facilities that will be available to the employees. The railway of the Chattanooga Transportation Co. runs through the property, and the schools, theatres, and churches of Chattanooga will be easily accessible.

According to information given out locally, the plant will be well laid out and so arranged as to permit of easy and convenient growth. Ground room is left for the considerable expansion of each department with minimum expense, at such time as growth of the plant requires it.

The raw storage room will be 650 ft. long and 60 ft. wide, with a capacity for rock storage of 15,000 tons; shale storage, 5,000 tons; coal storage, 5,000 tons; clinker, 150,000 bbls., and gypsum, 500 tons. An elevated railway will carry the raw material to the storage department, where it will be dumped automatically. By means of an electric crane, the rock and shale are to be transported from there to the raw grinding department, where the mixture will be sampled and analyzed by chemists. It will then be carried to the slurry storage department for a second analysis.

The machinery selected for the new plant is simple and modern, and it is standardized in every detail. Parts of machinery used in every department will be interchangeable with parts used in the other departments. This, it is estimated, will eliminate much of the expense of the repairs.

A water tank will be provided for fire protection. It will have a capacity of 100,000 gals., with hose connections extending over the entire plant.

John L. Senior is president of the company, W. A. Sadd chairman of the board, J. P. Hoskins treasurer, and Ralph Law secretary.

Financial reports submitted at the annual meeting of the shareholders of the Oregon Portland Cement company showed that the activities of this important infant industry for the year to November 30, 1921, yielded a profit and that it is now on a firm footing.

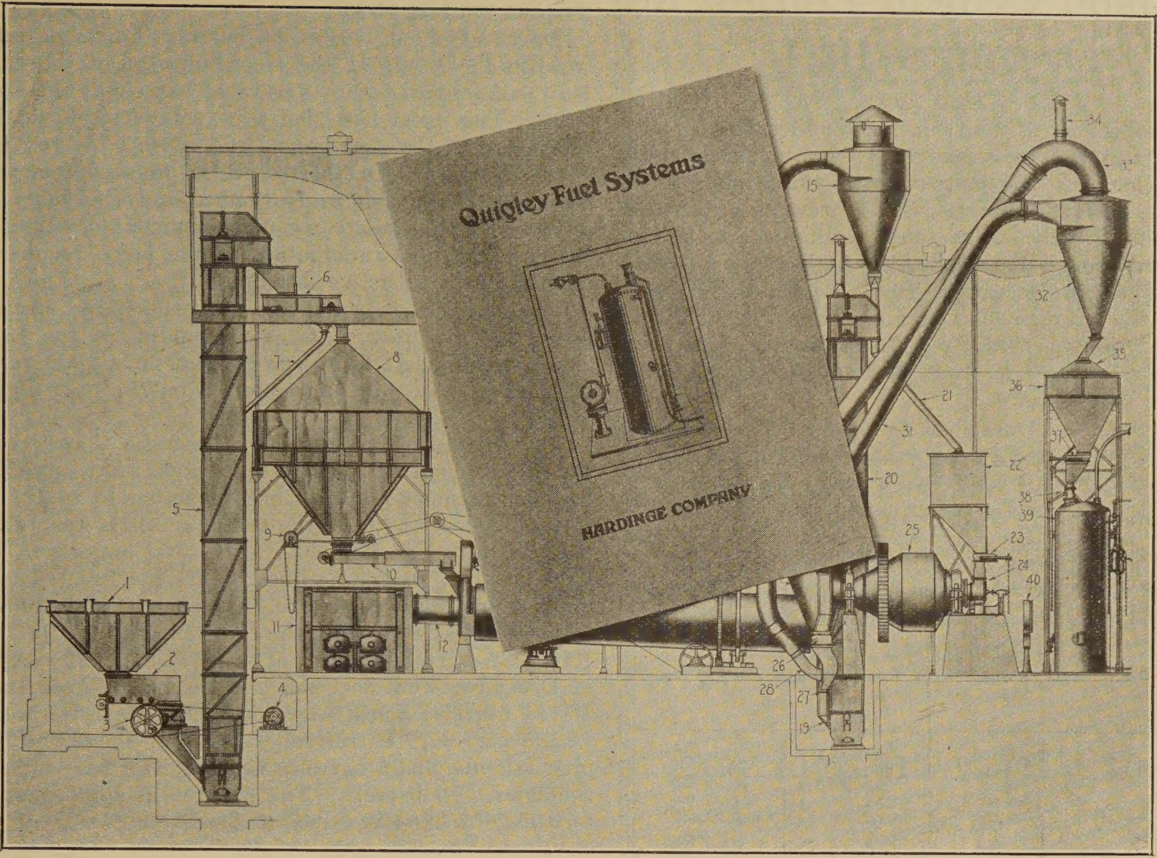
The initial dividend paid was at the rate of 3½% amounting to $30,618 on $874,800 of preferred stock.

A significant part of the report of General Manager Newlands was that the production cost of cement is declining and that for the current year an increased demand for cement is expected to grow out of home building and other construction enterprises.

Directors were re-elected as follows: R. P. Butchart, M. J. Ballard, A. H. Devers, Chester Dolph, F. I. Fuller, George Lawrence, Jr., George Macdonald, L. C. Newlands and A. S. Patullo. These officers were reelected: R. P. Butchart, president; L. C. Newlands, vice-president and manager, and George Macdonald, secretary and sales manager.

H. P. Davidson was elected assistant secretary.

Most of the stock was voted by J. C. Ainsworth and Franklin T. Griffith, proxy holders.



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Portland Cement Output in December 1921

The production of finished portland cement in the United States in December, 1921, was approximately 6,559,000 barrels. As compared with the production in November, 8,921,000 barrels, this represents a decrease of 2,362,000 barrels. A seasonal decline was to be expected, and though the production in December, 1921, was less than in December, 1920, it was about 14% more than the average for December from 1917 to 1921. The production in 1921, 98,293,000 barrels, was over 98% of that in 1920, and was greater than that for any other year except 1920.

The shipments in Docember, following the usual trend, showed a decrease from those in November. The movement in December, 3,697,000 barrels, was over 9% greater than that in December, 1920, but was slightly below the average for December during the last five years. The shipments made during the last half of 1921, 54,976,000 barrels, were approximately the same as those made during the last half of 1920. The total shipments in 1921, about 95,051,000 barrels, were nearly 99% of those in 1920.

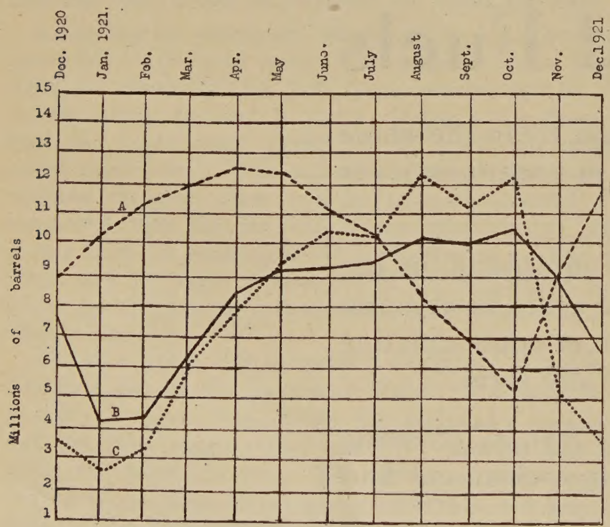
Stocks of about 11,938,000 barrels of finished cement were in the hands of the manufacturers at the end of 1921, as compared with 8,941,046 barrels at the end of 1920. This total exceeded the average stocks in hand at the end of the year from 1917 to 1921 by over 27%. From April until October stocks of finished cement decreased steadily, but in November and December they increased. Stocks are usually accumulated during the colder months in anticipation of the large requirement in the months of active demand.

The statistics shown in the following table, prepared under the direction of G. F. Loughlin, of the United States Geological Survey, are based mainly on reports of producers of portland cement, but in part on estimates.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that imports of hydraulic cement in December amounted to 25,327 barrels, valued at $57,064; the total for 1921 was 122,317 barrels, valued at $388,828. The total imports in 1920 were 524,604 barrels, valued at $1,254,729. The exports of hydraulic cement in December were 96,300 barrels, valued at $282,074; the total exports in 1921 were 1,181,024 barrels, valued at $4,277,135. The exports in December went to Cuba and the other West Indies, 48,781 barrels; South America, 25,828 barrels; Mexico, 11,203 barrels; Central America, 6,238 barrels; Philippine Islands, 3,205 barrels; Canada, 266 barrels; other countries, 779 barrels. The exports in 1920 amounted to 2,985,807 barrels, valued at $10,045,369.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT IN 1921, BY MONTHS

Month	Production (barrels)	Shipments (barrels)	Stocks at end of month (barrels)
January	4,098,000	2,539,000	10,300,000
February	4,379,000	3,331,000	11,400,000
March	6,763,000	6,221,000	12,000,000
First Quarter	15,240,000	12,091,000	----------
April	8,651,000	7,919,000	12,600,000
May	9,281,000	9,488,000	12,450,000
June	9,296,000	10,577,000	11,150,000
Second Quarter	27,228,000	27,984,000	----------
July	9,568,000	10,301,000	10,414,000
August	10,244,000	12,340,000	8,280,000
September	10,027,000	11,329,000	6,953,000
Third Quarter	29,839,000	33,970,000	----------
October	10,506,000	12,114,000	5,348,000
November	8,921,000	5,195,000	9,091,000
December	6,559,000	3,697,000	11,938,000
Fourth Quarter	25,986,000	21,006,000	----------
	98,293,000	95,051,000	----------



Monthly fluctuations in
(A) Stocks of finished portland cement at factories.
(B) Production of finished portland cement.
(C) Shipments of finished portland cement from factories.

Imports and exports of hydraulic cement in 1921, by months.

Month	Imports (barrels)	Exports (barrels)
January	14,678	225,561
February	18,269	84,230
March	7,631	97,302
April	1,540	93,009
May	2,035	82,409
June	1,657	100,831
July	3,455	81,091
August	10,988	84,538
September	5,177	84,668
October	11,448	79,871
November	20,112	71,214
December	25,327	96,300
	122,317	1,181,024

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce.

Men and Mills

Notes from the Field

The Bath Portland Cement Co., Bath, Pa., is remodeling its coal plant by installing three modern 42-in. Fuller mills for pulverizing coal. A Fuller-Kinyon conveying system is being installed in connection with these mills, which will convey the puverized coal from the mills to the kiln bins. The conveying line will eventually be extended to the stone dryers, which will be fired with pulverized coal.

The modern waste heat boiler plant, which has recently been put into service, will also use pulverized coal as an auxiliary fuel, the supply of pulverized coal being furnished from the coal house by means of a Fuller-Kinyon pump.

The Continental Portland Cement Co., Continental, Mo., is installing a modern coal pulverizing and conveying system for handling fuel. This system includes three 46-in. Fuller-Lehigh pulverizer mills and one Fuller-Kinyon system for conveying the coal from the mills to the various furnace bins.

The Peerless Portland Cement Co., Union City, Mich., is installing two 42-in. Fuller mills in the coal house for preparing all the pulverized coal used as fuel in this plant.

Cement companies in the locality of Bath and Nazareth, Pa., have posted notices of still further reduction of wages with the beginning of the new year.

The Louisville Cement Co. was forced to close down its power plant when Milltown was visited by a flood recently. The worst damage suffered by the Louisville Cement Co. was at the point where the R. R. tracks approach the bridge on Blue River. Here the bed of the track was washed out entirely. The river at some points showed a higher gauge and at other points a lower gauge than the 1913 flood.

Several employes of the Louisville Cement Co. live in Mill street and their homes were damaged by water.

The Nebraska Cement Co. has closed its plant and all men are now laid off save a number who are retained for the repair and improvement work that is going on. The large silos are full for the spring trade and it will be probably sixty days or more before the men are recalled for work. The plant had a record run last fall and everything worked very nicely. A 400 horse power motor is being installed to operate the second compeb mill, which replaces the last of the old grinding mills.

W. A. Gibson, works manager for Bradley Pulverizer Co., Allentown, Pa., who recently underwent an operation at a local hospital, is reported to be making satisfactory progress toward recovery.

The Traylor Engineering and Manufacturing Co., Allentown, Pa., has recently sold two kilns to the Dexter Portland Cement Co.

At the plant of the Superior Portland Cement Co., practically the entire crew has been diverted to repair work, and the entire mill is being given a thorough overhauling. It is not likely that operations will be resumed until about March 1, as it will take about that long to finish the repair work now under way.

The White Star Cement & Coal Co., organized as follows, according to advice from Allentown, Pa.: President, A. G. Connolly; secretary, Charles W. K. Shafor; treasurer, G. A. Schneebell. The purpose is to erect a million barrel cement plant on the company's property in Birmingham, Alabama. Richard K. Meade & Co., of Baltimore, Md., are the engineers.

E. J. Lynch, local representative for the state bureau of inspection, made the rounds of the cement plants in Lehigh and Northampton counties, during the latter part of December.

Reports from La Salle, Ill., indicate that the cement industry in that locality is very quiet but that conditions are practically normal at the plants of the Alpha Portland Cement Co., and the Marquette Cement Mfg. Co., for this season of the year.

The annual meeting of stockholders of the Signal Mountain Portland Cement Co. was held Jan. 19, in the company's offices, the main matter of business being the election of a board of directors. The old board was reelected and Frank Senior, vice-president of the McClennan Construction Co., New York, was added to the board. The meeting of the directors was postponed until about Feb. 1.

The cement plants in the Nazareth and Bath sections were badly hampered by a severe storm in December. Power plants of the cement works were most affected.

Work of removing topping at the Pennsylvania Cement Co.'s plant has been discontinued for the winter.

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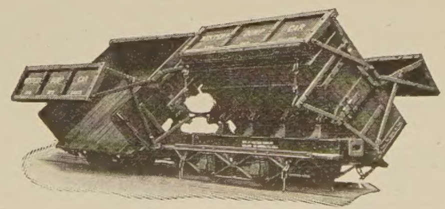

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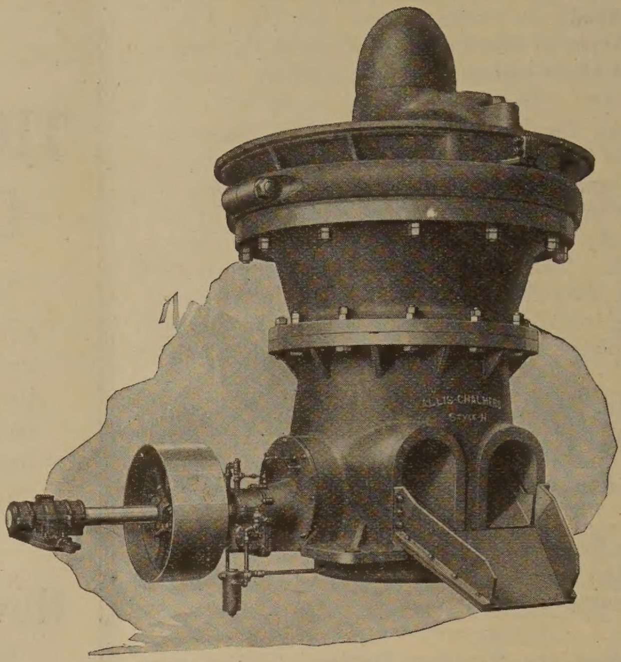

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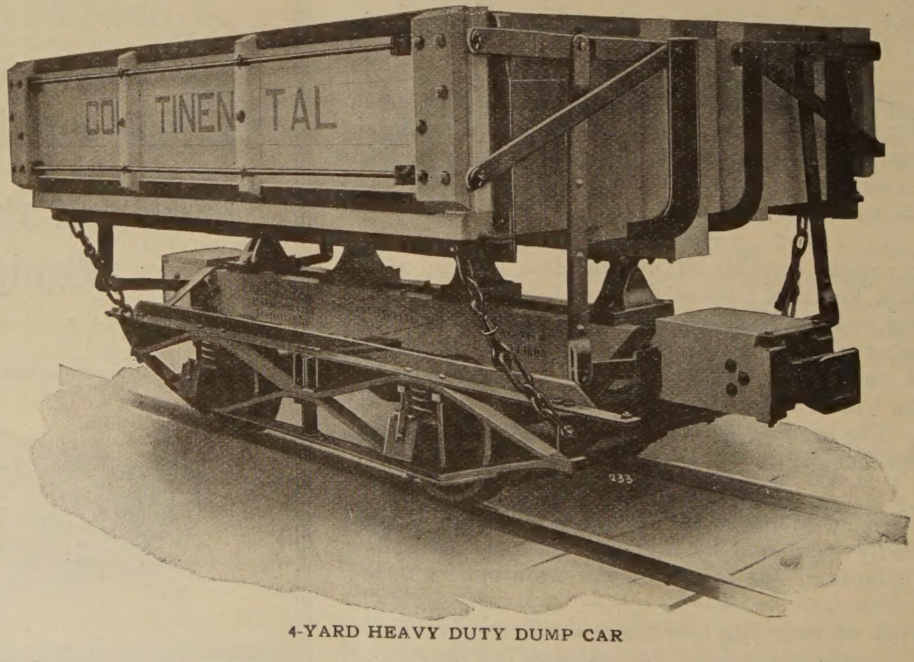

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